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Electric Railway Review

FORMERLY THE STREET RAILWAY REVIEW

The name of this publication was changed with the July, 1906, issue. This index includes the subjects appearing in the Street Railway Review, January to June, 1906, and in the Electric Railway Review, July to December, 1906.

VOLUME XVI

July
~~January~~ to December, 1906

THE WILSON COMPANY
Monadnock Block
Chicago

v. 16
pt. 2

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Electric Railway Review

PUBLISHED MONTHLY BY THE WILSON COMPANY, CHICAGO
NEW YORK: 150 Nassau Street CHICAGO: 1660 Monadnock Block PITTSBURG: 510 Frick Building
Subscription Price, $1; Foreign, $3; Single Numbers, 10 cents
Entered at the Post-Office, Chicago, Ill., as Second-class Matter
VOL. XVI JULY, 1906 No. 7

Keep the Shops Clean.

It is not possible to express in definite figures the influence of cleanliness in promoting first-class repair shop work. Nevertheless, it is well worth while to make an effort to reduce the accumulation of dirt in the repair department to a minimum, for the moral effect of a clean shop upon the quality of workmanship performed is well known. Much can be accomplished by blowing out motors, sweeping cars, cleaning cushions, etc., out of doors, instead of in the machine or paint shop and the widespread use of compressed air in car braking offers an easy means of distributing cleaning power wherever it is needed. Some of the later shops are equipped with blower and duct systems which exhaust sawdust and shavings from woodworking machinery; in others care is shown in the saving of metal chips and scrap in the machine department, and liberality in the apportionment of daily cleaning by special employes. Raised gratings or parallel slots on the benches where field coils are repaired are a help in the work of maintenance, and the use of covered coal cars in transit through the shop yard and buildings is worth considering. Cleanliness reduces the fire risk, also, and with cheap power it should not be hard to secure a reasonable degree of this kind of protection.

Helping the Railroad Commissioners.

In the course of a brief address before the New York State Street Railway Association at Saratoga, Mr. C. R. Barnes, the engineer of the New York Railroad Commissioners, calling attention to a field wherein the association and the commission could co-operate to the advantage of themselves and of the public, stated that it would be the policy of the commissioners to encourage such co-operation, and suggested a subject for immediate action. The matter thus brought before the association was the height of car steps, concerning which the railroad commission has received complaints, and the association at once authorized the appointment of a committee with instructions to investigate and report at the next quarterly meeting. The attitude of the railroad commission is that causes for complaints of this nature can be remedied better by the railways than by any process of the commission. This is correct, and it is also especially advantageous for the railway companies to have proposals relating to changes in details of equipment thoroughly canvassed by their own officials who appreciate all the conditions.

From Mules to Moguls and Motors.

The venerable Delaware & Hudson Company is a striking example of evolution in transportation. Chartered in 1823 to build a canal, it was engaged in water transportation for about three-quarters of a century. In the late twenties it built a gravity railroad to feed the canal. Later on it acquired and built steam railroads. Within the last year it has been acquiring electric railroads. The Delaware & Hudson Company now owns a half-interest in the Schenectady railway, running between Albany and Schenectady. It controls with almost complete ownership the United Traction Company, comprising all the street railways in the cities of Albany and Troy, and the interurban line between. Whether the process of evolution shall continue until aeronautics become but a branch of railroad transportation and branch lines shall diverge vertically as well as to the right and left, the history of the past century makes difficult to foretell. If so, doubtless the Delaware & Hudson will be there.

Self-Government of Employes.

An interesting feature in the organization of the Illinois Valley Railway is the method used in maintaining discipline among employes. The method is that of self-government and the employes are practically their own disciplinarians. The employes, with the sanction of the general manager, select a committee of three of their number, the duty of which committee is to keep in close touch with the employes and to investigate any charges of disorderly conduct made against any employe. Upon the recommendation of the committee a motorman or a conductor is discharged without further investigation. The members of the committee receive no pay for their services while conducting an investigation except when such service conflicts with their daily duties. They are chosen from the list of those who have been longest in the service of the road. Since this system of discipline was inaugurated the men have taken an increased interest in their deportment. As a direct result of this organization detail a better class of men is available for train service, the social standing of the employes is greatly improved and there is greater harmony among the men themselves.

The Lion and the Lamb.

Although the question of car diversion is just now so fruitful a subject for discussion among the transportation officers of the steam roads, it is a problem which so far the electric lines have not been set to solve—yet it is one which with a rapidly developing freight service, and an increasing use of freight cars, they may look towards as a question for their careful solution in the near future. In this connection the experience of a prominent interurban road of the Central West may prove interesting. A little over a year ago this company purchased twelve box cars from an eastern firm, ten of which in due course of time arrived at their destination. The other two were stopped, loaded in transit and shipped east again. These cars have not yet reached their home road, although the owners are kept informed of their existence by bills for repairs. Up to date the repairs on these cars have amounted to $70 or $75, while the earnings have not amounted to over $20. As the company which bought the cars was not at the time of the purchase a member of the American Railway Association, it could not collect per diem or demurrage on these cars, and was only allowed mileage, amounting to $.006 per mile. According to Mr. J. W. Midgley, of Chicago, who is recognized as an authority on these matters, the average earning capacity of a standard freight car—taking the total number controlled by American railroads for an entire year—is about $2.12 a day. The average earnings of a car under the per diem system are about 23 cents a day. The cost of building and operating a standard freight car, worth about $700, is $112 per annum, including interest on investment, insurance, depreciation and repairs. Thus these two lost cars, which ought to be earning for the company $2.12 each per day, or a total of $1,547.60 for the year, and which under the per diem system should earn $167.90, are actually earning $20 and are costing the company $224 for the year.

All Departments Pulling Together.

Believing that the successful operation of a growing property depends to a considerable extent upon the harmonious co-operation of the heads of the various departments, the Illinois Valley Railway Company has provided for "cabinet meetings" of its department heads. These meetings are held once a week and are productive of good results. At such meetings operation details and plans for better serving the public are discussed in an informal way, differences that may arise between the various departments during the week are adjusted by a vote of the representatives present and all business coming before the meeting is disposed of in a parliamentary manner. Since the discussions are confined entirely to the meetings they are more of a detail nature than might otherwise be the case. The members of the cabinet are the general manager, general superintendent, master mechanic, superintendents of power, express and freight, train service, the roadmaster and chief lineman. The general manager acts as chairman and the general superintendent as secretary of the meetings.

A Railroad with a Future.

The Great Falls & Old Dominion Railroad, extending from West Washington (Georgetown), in the District of Columbia, to the Great Falls of the Potomac in Virginia, a distance of 13 miles, was opened for business in March, 1906. For the half mile over the viaduct bridge the underground trolley is used in accordance with the laws of the District of Columbia. The remainder, all in Virginia, has overhead single trolley. The road is owned by Hen. John R. McLean, Senator Stephen B. Elkins, and associates. It was constructed in the most substantial and thorough manner by the Westinghouse-Church-Kerr Company. No bonds have been issued; nor has there been an issue of stock for public subscription or sale. The road runs through a fine farming country in Fairfax county, Virginia, but the population is sparse. It has been a matter of considerable local gossip as to why so expensive a road should have been constructed in so thinly settled a country. Various theories have been advanced, among them that the road would eventually be used as a Washington entrance for the Wabash system, or as the nucleus of a tidewater outlet at Alexandria, Virginia, for the undeveloped soft coal fields in the eastern part of West Virginia. Steam railroad men who have seen the property say that a road with three and one-half per cent grades will never be utilized for steam locomotives; that a new road could be built more cheaply than the present line of sharp curves could be revised. Meantime the owners of the road very wisely let the other people do the talking and saw wood.

The Transfer Follows the Flag.

The passenger traffic of this new line has exceeded expectations. The Great Falls of the Potomac are located in a wild and romantic region. There is roundabout a wealth of historic interest for the traveler, the student, the revolutionary daughters, and the colonial dame. Here George Washington worked as a young surveyor for his patron, Lord Fairfax. So popular has the line become that the original six cars are to be doubled in number. The "Old Dominion," as it is popularly termed, has made a vain effort to obtain from Congress a charter to build a cross-town line in the city of Washington. Failing in this, it is stated that the owners have become heavy buyers of the securities of the local traction companies. Washington, the home of science, the nursery of investigation, may yet see outside its great museum a tail which waggles the dog. Color is lent to this belief by the very liberal arrangements that the new company has been able to make for city transfers. By one of those strange admixtures of sentiment with business that sometimes occur, city transfers are made good for passage for several miles into Virginia, and the suburban transfers vice versa. What is now Alexandria county in Virginia was a portion of the District of Columbia until, as one of the slavery compromises of the ante-bellum period, it was retroceded by Congress to Virginia in 1846. Corporations have no souls, but in this case much patriotism. As a reflection of the present era of good feeling, a passenger in this united country, finds that his transfer follows the flag across the Potomac and recognizes only the limits of the federal District, as founded by the fathers.

Zones of Clean Transportation Currency.

An interesting feature of the broad and liberal policy of the Great Falls & Old Dominion Railroad is the collection of fare by zones. Congress requires lines in the District of Columbia to sell six tickets for 25 cents. The quarter may have been used a thousand times, but the tickets are in brand new sheets, the law forbidding the resale of collected tickets. The Old Dominion honors these tickets in Virginia and has arranged for its own tickets to be part of the District of Columbia's local transportation currency. The nine or more miles of line beyond the above mentioned transfer limit are divided into three zones. A ticket or a five-cent cash fare is collected for a ride over any portion of a zone; four tickets, or three tickets and a transfer, being necessary for through passage from one end of the line to the other. Strangers sometimes become nervous at the frequent fare-ringing thus necessitated. Comparisons are made to a party of cowboys striking the bull's-eye bell of a shooting gallery target. However, the native politeness of the Virginia conductor is reassuring and the stranger, like the regular, soon allows himself to feel honored by so audible and frequent a recognition of his possession of the price. Half the fun in having money is the consciousness of the other fellow's realization of that happy condition.

Advantages of the Zone System.

There is no more serious problem for electric railways than rates of fare, and the consequent unit of compensation. There are many strong arguments for the zone system. It is simple and easily administered. It avoids the necessity for station ticket sellers and the cumbrous paraphernalia of printed tickets of various classes and destinations. Moreover, it appeals to the sense of fairness of the traveling public. Under a system of fares based on actual mileage there spring up petty grievances, little adjustments and attempted equalizations. These, in contracted territory, pave the way to real or fancied conditions of discrimination. Popular content and local satisfaction with the methods of a corporation are an asset making for a continued absence of drastic regulation.

The Old Man's Sons.

An ambitious young railway official left a large system to take charge of a small road. He was asked why he took what seemed to his friends a backward step. His explanation was that the president of the larger company had two sons in its service, and that the general manager had three brothers on the payrolls. The young man did not quarrel with this condition, but feeling that blood is thicker than water, thought that he would fare better elsewhere. Events proved that he was right. When society was less highly organized it was natural and proper for a son to follow the vocation of the father and for families to be associated in the conduct of business enterprises. The capital invested was the property of only a few persons, and it was the birthright of the son to profit by the accident of his father's station. Under the feudal idea, power as well as property was a legitimate fruit of heirship. Today the executive and managing officer is a trustee for the directors and stockholders of the corporation. It may happen that it is the kind of corporation known as government, an organization of the body politic, which is being administered. Public policy and enlightened sentiment everywhere are opposed to such official positions passing by descent. Industrial organization is more despotic and one of its uncorrected abuses is nepotism. The corporation may be fortunate in securing the services in high positions of young men, whose natural ability and technical training are supplemented by a hereditary instinct for the particular business in hand. The narrowing margin between success and failure does not admit of taking such long chances. It is better to let the inherited genius find its outlet in a different field. The supply of able and trustworthy men is not so limited that the home corporation will long suffer for want of talent. To argue otherwise is to betray a lack of perspective.

Objections to Nepotism in Corporate Life.

The objections to nepotism in corporate life are two-fold: First, the father or other powerful relative is often put in a false light. Human nature has its weaknesses, and it is only human for the father to be hoodwinked into believing that it is the general manager or the general superintendent who has, as a routine matter, covered the latent merit in the chip of the old block. The rank and file are not so blind. Their love of fair play presents the matter in its true light, and by just that much is the father dwarfed in their estimation. He may be big enough and strong enough to overcome this effect, but stockholders have a right to insist that their chosen trustees shall not be handicapped by such amiable indulgences. Second, from the subjective view, the son, or other beneficiary of relationship, is the worst sufferer after all. Too much of his natural energy has to be wasted in maintaining an equilibrium between the sycophants on one hand and the nagging detractors on the other. However forceful and fortunate he may be, his success will always be discounted by the ever-present idea of undeserved and unequal opportunity. Sometimes the father, like the Roman of old, is severe. To forestall criticism he goes to the other extreme and the son is undeservedly held back. The best solution seems to be the course adopted by many prominent men of having the young man, who aspires to his father's calling, cast his lot with some other property. There he will have the benefit of his powerful relative's influence without the corresponding drawbacks for all concerned. Neither amendments to charters nor additions to by-laws will produce this happy result. It must spring from a healthy public sentiment, which loves fair play and welcomes the closest possible approximation to equal opportunity.

Cheaper to Give Nickels than Carry Passengers.

In commenting upon a reported statement of President H. H. Vreeland, of the New York City Railway Company, a contemporary brings out an interesting point in the question of the long and short haul as applied to street railway systems. Mr. Vreeland is quoted as having said that it would be more profitable to station an agent at One Hundred and Twenty-fifth street and Eighth avenue and give each downtown passenger a nickel to travel on the elevated line rather than have him make the trip on a surface car. This simply means that the long-distance passenger would occupy a seat in the surface car which might otherwise be sold several times over to short trippers. If the passenger took an express train on the elevated line he would occupy space that could be sold but once. The haul would be quickly made and the company would then be able to use the equipment a second time. Therefore the reasonableness of the statement, which at first glance seems rather remarkable, is readily apparent.

Compound Track Rails.

Many attempts have been made in the past to design a compound rail for street railways, but none of these attempts has met with pronounced success. The great difficulty always has been to find a method of keeping the fastenings secure so that the parts will act as one solid piece. The Romopac Tramway Construction Company, of Leeds, England, is now introducing a system which, although as yet in the experimental stage, seems to give promise of better results than have been attained heretofore. In this system the permanent portion of the rail is like the ordinary T-rail, but has a smaller head with a flat surface and sides inclined inwardly toward the web. The cap, or wearing head, is a rolled-steel bar of channel section with a grooved running surface in accordance with the general English practice. When these cap rails are laid in place upon the girder portion of the rail, a machine is run over them carrying small serrated rolls driven by powerful gearing, which bend the flanges of the channel rail inwardly until they are in close contact with the sides of the head of the girder. When the cap is worn out and must be replaced the same machine is run over the rail, cutting a deep groove in one of the flanges and splitting it so that the cap may be removed. To build new track the substructure is laid and the girder rail set in place in the usual manner, after which the caps are placed as described, the machinery being mounted on a car propelled by a steam engine and traveling at a rate of about 10 feet per minute. To renew the cap it is only necessary to remove enough of the paving alongside the rail to give room for the cutting and breaking-off device, instead of tearing up the entire track. The cost of renewing the rail in this way is only about half that of the ordinary system, as the cap weighs only about 40 per cent of the complete rail.

Joint Single-Track Service.

The Keokuk & Western Illinois Electric Company operates an electric railway between Keokuk, Ia., and Warsaw and Hamilton, Ill. The line is about eight miles long and for four miles the electric cars are run over the track of the Toledo Peoria & Western Railway, a steam road, and for about two miles over a track used jointly by the Wabash and the Toledo Peoria & Western. The electric cars are operated on a schedule which is so arranged that it does not conflict with those of the steam roads. All steam trains running on schedule time have the right of way over electric trains. When steam trains on the Hamilton-Warsaw line are late conductors of electric trains are required to obtain telegraphic running orders from the dispatcher's office at Peoria. The timetables provided for the Keokuk & Western Illinois show the time of arrival of each train on the three systems at Keokuk, Hamilton and Warsaw. The electric railway company pays an annual rental to the steam railroads for the privilege of running over their tracks. In crossing the Mississippi river a bridge owned by the Keokuk & Hamilton Bridge Company is used. A rental proportionate to the number of passengers carried each trip during the year is paid for the use of this bridge. Record of the passengers carried over the bridge is kept by using a bridge check made out in duplicate by the conductor and given each passenger. One-half of the check is given the bridge-tender, the duplicate portion being turned in at the office of the company.

CHARGING FOR HYDRO-ELECTRIC POWER.

"Sale of Water Power" was the principal subject discussed at the Saratoga meeting of the New York State Street Railway Association, papers being presented which treated the matter from three different standpoints, that of the producer, the middleman, and the consumer. A perusal of these papers will show that all agree as to the conditions which must be considered in fixing a rate for hydro-electric power, namely: first cost of the generating and distributing plant, the amount of power used, and the load-factor. All agree that the power company or producer must receive a price that will pay a return on its investment and that the consumer is not unreasonable in expecting to pay less than power generated in his own plant would cost. There is also agreement that the rate should vary with the load-factor of the consumer's plant and that it must be equitable for both parties. The question as to what is equity is the only one debatable.

Three bases of charging for hydro-electric power are discussed in these papers: 1. A flat rate per horsepower per year. 2. A rate per kilowatt-hour, with a minimum load-factor guaranteed. 3. A variable rate per horsepower per year determined by adding to a fixed rate for service the product of the load-factor into another fixed rate; the rate per horsepower is computed monthly, using the average daily maximum demand in finding the load-factor for the month.

Base No. 1 requires on the part of the producer a rate so high that a horsepower having a low load-factor cannot contract for its maximum demand, if economy is desired, but must install auxiliary plants to carry the peak-loads.

Base No. 2 is designed to appeal to the consumer as a good one because he pays for what he gets, but as the load-factor increases the equivalent rate per horsepower per year also increases, and may reach absurdly high figures.

Base No. 3, as presented by Mr. Storer, when reduced to rates per kilowatt-hour shows lower rates at low load-factor, and higher rates at high load-factors than Base No. 1. As the flat rate per horsepower per year must be high enough to pay the producer cost and a reasonable profit, the power user who has a high load-factor finds Base No. 3 a bad one for him.

It is apparent that with any method of fixing the rate change in conditions may turn what was a good bargain when made, into a bad one. In other words, the power contract is something of a wager. We understand, however, that the power companies do not wish customers to assume all the risks, and that those which contract on what we have called the third plan will give to the customer the option of changing to the flat rate per horsepower per year within an agreed time. This gives opportunity for the customer to study his power conditions and to choose the form of contract which best suits him, certainly an equitable arrangement.

Customers having low load-factors and selecting the third plan are, individually, getting power at less than cost to the producer. The producer, however, by "overselling" his capacity, that is, contracting to deliver the same power to several purchasers on the chance that the maximum demands from each will not be simultaneous, is enabled to make the low-rate customers profitable when taken collectively. It is somewhat anomalous that retail customers can actually be given better rates than the wholesale users.

There is diversity of opinion as to what should determine the maximum demand; Mr. Harvey proposes the maximum two-minute peak and Mr. Storer the maximum one-minute peak. This is a matter of convenience rather than principle since the longer the peak time taken as a base, the greater is the probability of peaks of different customers being simultaneous, consequently the producer cannot oversell his capacity to so great an extent, and must charge a higher rate for power.

An important and interesting part of Mr. Harvey's paper is his analysis of the railway power conditions and the method of determining the extent to which a railway company can use hydro-electric power economically. The situation in New York, with hydro-electric generating stations on the Hudson and the Niagara, and transmission lines almost across the state, made these three papers on contracting for power most opportune. It is one of the oddities that although hydro-electric power is measured in kilowatts it is sold in horsepower; the rate per horsepower is smaller and customers not familiar with electrical measurements find horsepower easier to understand.

THE AIR RESISTANCE OF ELECTRIC CARS.

Among the permanent benefits of scientific value resulting from the St. Louis Exposition, the work of the different testing commissions must be given a high rank.

The fuel testing plant is still in operation and its work is regarded as having so much value that a large appropriation has been secured for continuing it another year. The locomotive testing plant was not only an interesting exhibit of itself, but the report of the commission in charge of it contains the record of the most accurate measurements of locomotive performance that has ever been made.

The report of the Electric Railway Test Commission has now been published in a substantial volume which gives the results of extended tests covering nearly all phases of electric traction. A general account of these tests will be found in another page of this issue. In addition to the tests of acceleration and braking made at St. Louis, a series of service tests was made on a 5-mile tangent of the Indiana Union Traction Company's system. These included air and train resistance experiments with a specially constructed air pressure dynamometer car, which was designed by members of the committee. The air resistance tests which were made with this car are highly original, and the data obtained must be of great value to the electric railway interests.

The resistance due to head-end air pressure on vestibules and car bodies was obtained for speeds varying from 25 to 70 miles per hour. This air component of car resistance was measured independently of the total resistance and in order to do this it was necessary to suspend the car body above the trucks, so that the air pressure on the former could be measured by suitable dynamometers. The vestibule was also suspended separately from the car body and in this way the head-end pressure was measured and its proportion of the total resistance determined. The particular value of such data lies in their application to the design of the shape of the front end or vestibule of railway cars, and four different shapes were used in the experiments as follows:

1st. A vestibule with a plain flat front.

2nd. The standard vestibule as ordinarily used on interurban cars, the car width being being 8 feet 4 inches and the radius of curved front 5 feet 6 inches.

3d. A parabolic vestibule having a length of 6 feet 3 inches.

4th. A vestibule having a wedge-shaped extension of the parabola 2 feet beyond its end.

This is perhaps the first time the head-end resistance of cars having different shaped fronts has been measured separately from the total resistance, and the chief value of these measurements lies in showing the large proportion of the power required to overcome head resistance, and the value of tapered ends for vestibules as compared with flat ends.

While the advantages of wedge or parabolic shapes for the fronts of high speed locomotives and cars have been recognized heretofore, they have not been considered of sufficient importance to be adopted in regular practice on the steam lines of this country although the practice of using beaks on locomotives is growing in Europe, especially in France and Germany. The Berlin high speed tests demonstrated the value of the tapered front for the motor cars, and recent high speed express locomotives for the Bavarian State Railways have tapered casings on the smoke box, the cylinders, the steam dome and the cab. The best example of a car designed to have the least air resistance is that of the Union Pacific motor car No. 7, which in its external shape, front and rear, is almost an exact copy of the one proposed by the Electric Railway Test Commission. In this car the front is a long parabola with wedge end and the rear portion of the car is given the form of a short parabola.

In the experiments made by the St. Louis commission it was found that in all cases the rear vestibule air resistance proved to be a suction, the effect of which is to retard the motion of the car. With the standard vestibule at the rear the power absorbed by the suction of the air amounts to 16 horsepower at 60 miles per hour. It was therefore considered important to give this portion of the car a sharper beak than that provided in the ordinary vestibule when intended for high speed service. It was soon demonstrated that the shape of the front end was important as it was not possible with the motors and current available to drive the test car with a flat end at a speed exceeding 50 miles per hour, while it was easily sufficient to permit a speed of 75 miles per hour with the parabolic wedge front vestibule.

The report contains tables giving the air resistance under various conditions from 20 to 100 miles per hour, and while few measurements were made above 60 miles per hour, the values above this were obtained by plotting the observed results and projecting the curves in accordance with the same general law underlying the form of all curves of the series. The general results obtained from these tables and curves indicate that at all speeds the pressure per square foot on the parabolic wedge vestibule is only about one-fourth that on the flat vestibule, and for all shapes tested the unit pressure at 80 miles per hour is 10 times that at 20 miles per hour. Thus at 60 miles per hour the unit pressure on the wedge vestibule is 2.10 pounds, while that on the flat one is 8.20 pounds. For the flat vestibule it is 1.4 pounds at 20 miles per hour and 14 pounds at 80 miles per hour, while on the wedge vestibule it is .4 pounds at 20 miles and 4 pounds at 80 miles.

Coming now to the power absorbed in head end pressure and rear suction for the different shaped vestibules, we find the same relation for all speeds above 20 miles per hour, namely, that the flat vestibule absorbed about four times as much power as the one with a parabolic wedge. At 40 miles per hour the standard vestibule absorbed twice as much power as the parabolic shape and three times as much as the wedge parabola. At 20 miles per hour the flat vestibule required 7.18 horsepower to drive it, while the wedge parabola absorbed only 2 horsepower, and these relations at 60 miles per hour are 126 horsepower for the flat end and 32 for the wedge. The large proportion of power required to drive the car, which is absorbed in overcoming air resistance, is given for the different shaped front ends in a final table. Here we find that with the flat end at 40 miles per hour out of a total of 39.8 kilowatts 28.7 kilowatts are absorbed by air resistance, while with the wedge parabola end only 7.5 out of a total of 18.4 kilowatts is thus absorbed. At 60 miles per hour these relations for the flat end are 100 and 123.5, and at 80 miles per hour 202 and 246, while for the wedge shape they are 29 and 54 at 60 miles per hour, 76 and 119 at 80 miles per hour. The great advantage of the long tapered front for high speed electric cars is thus demonstrated beyond question, and the use of them should have an important influence in determining the size of the motors required, as well as in a substantial reduction of the power required for a given speed, and a consequent economy of operation.

STORAGE BATTERIES ON ALTERNATING-CURRENT RAILWAYS.

The development of the single-phase electric road within the past two years raises an interesting question in regard to the usefulness of the storage battery on a purely alternating-current system. In various parts of the country exciter batteries have been quite largely adopted by important alternating stations for the insurance they provide against interrupted current in the generator fields. Electric roads using alternating-current generation and transmission, with direct-current distribution, have frequently found the storage battery a valuable auxiliary in the substation, but thus far the straight, single-phase line has remained, in the minds of the engineer, largely without the field of battery application.

There is no reason, however, why the storage battery should not become an important factor of the equipment of a single-phase road, even in cases where reserve power and the ability to absorb severe fluctuations are sufficiently important to warrant the investment. The battery manufacturers are keenly alive to the desirability of making this product essential to the welfare of the single-phase road, and, although several important patents are still pending as to the best methods of regulation in charge and discharge, the problem is financial in its aspects, rather than technical. While there are doubtless many single-phase undertakings where the cost of a battery is not justified by the conditions, it is certain that in other cases a battery equipment including the necessary transforming and regulating apparatus can be used to great advantage. The reduction of severe fluctuations to a fairly uniform load, means higher operating efficiency and greater flexibility in an alternating-current power station no less than in a direct-current plant, even though the former installation may require a considerable investment in revolving machinery for alternating-current to direct-current conversion. It is probable that the usual battery booster can be eliminated in single-phase application, so that the cost of the transforming motor-generating set or rotary, will be partly taken care of by this reduction in the usual investment.

For some time to come, however, considerable variety in design will probably be encountered in the apparatus necessary to connect the battery and the alternating side of the system. A recent method is to couple three machines together on a common bed-plate and shaft; the first of these is a three-phase, 60-cycle motor, the second a direct-current generator for battery charging and the third a 25-cycle, single-phase generator connected to the trolley line and ground. Such a set charges the battery in times of light load, changes the frequency of the transmission line to the lower frequency desirable for the single-phase motors, and permits the battery to take up the fluctuations of the railway load by discharging through the generator, which then runs as a motor. A simple arrangement suitable for a single-phase line uncomplicated by lighting or general power house service, is to install a rotary converter between line and battery, charging and discharging backward or forward through the machinery and the transformers. If the motor-generator set is wound for line voltage the transformers can be eliminated. Another method connects the battery with the line fluctuations through a booster, revolving commutator set and current transformers. The precise details of these methods remain to be standardized, but the fundamental capacity of the battery to reduce the peaks of the momentary and permanent loads, and to act as a reserve in case of the failure of the generating station, warrants an investigation of its financial and operating value on large, single-phase roads. In some cases the decision will be for the battery, in other cases against it, however, to the railway engineer who follows closely the extension of direct-current refinements into the field of alternating-current service, the experience of the next year or two will be full of interest.

FIRE PROTECTION IN OLD BUILDINGS.

The prevention and suppression of fire is as important in power plants and repair shops which are far from modern in design as it is in the latest generating stations and car houses. There is often a feeling on the part of the management of an electric road which is doing business without the best facilities of operation that it is not worth while to make the effort to secure operating economy which more favored roads make as a matter of course. We believe that such a view is mistaken, for some of the best records have been turned out by managers whose properties were in many particulars behind the most advanced practice in equipment.

No electric road can afford to be crippled by fire, either on the power house or rolling stock end of the business. Aside from the loss of valuable equipment, the losses which occur in earnings and public confidence when inadequate service is given are too great to be endured with any sort of equanimity. Scarcely a road in this country can be named which does not own at least one or two modern cars, and these cars as units are far more costly than the individual pieces of rolling stock of ten years ago. If expensive cars or even old cars in large numbers are operated on a system, and stored or repaired in old houses and shops, there is scarcely a better piece of work ahead of the management than the placing of those shops, car houses and power plants in reasonably safe condition as regards the fire hazard.

We have so frequently printed articles in regard to the reduction of fire hazards in shops and car houses that it will serve the present purpose to outline, by way of illustration, the protective measures in vogue at the Atlantic City shops of the West Jersey & Seashore Railroad. These shops consist essentially of old wooden buildings which were at one time stables for the local horse car system, and they manifestly cannot be looked upon as intrinsically fireproof. One's first impression on visiting them is the clean sweep a fire would probably make in case a stiff breeze should get started in any one of the buildings. The shops and car houses are close together, but they are well protected by judiciously placed hydrants on the different sides of the property. Permanent wooden ladders are attached to the sides of each building, so that it is a matter of but a few seconds to carry a line of hose to the roofs. A special fire alarm box, connected with the city, is installed in a central point in the yard.

The exterior of the blacksmith shop is lined with sheet iron; the sides of pits are lined with galvanized iron, and the pit bottoms are of concrete. Chemical extinguishers are placed at convenient points. In the paint shop, which is heated by an ordinary stove, the stovepipe has been covered with asbestos after the manner of high pressure steam piping, and care has been taken throughout the plant to keep hot metal work away from combustible substances. An admirable system of 3-ton overhead hand hoists running on tracks facilitates the transportation of equipment in times of emergency. The water supply is drawn directly from the city mains.

These measures are relatively inexpensive, and in old shops and plants can be supplemented by metal waste cans with self-closing covers, asbestos or sheet iron guards in the vicinity of gas jets, wire guards on lamps, etc. Special care should be taken to see that the wiring is in safe condition and that trolleys are placed down when cars are standing in the house. According to local conditions, so will the detailed steps necessary for protection be taken. Good organization in the car house and shop force is essential, and care in regard to the collection of miscellaneous articles in piles is quite as important as plenty of sand pails and water buckets. In shops and plants which are little more than tinder boxes wired glass windows, self-closing doors and shutters are comparatively valueless. Thermostat alarms and sprinkler systems, however, are well worth considering. It is hard to keep an old shop or plant in good condition, for such places are almost always cramped for room. Smoking is, of course, out of the question in a wooden shop. While every road should work toward improved facilities capable of handling its business, a great deal can be done with improving material if the right man occupies the executive chair.

RELATIONS OF LOCAL TO NATIONAL ASSOCIATIONS.

The state or sectional associations of electric railways have a distinct field in which they can serve the interests which they represent to advantage. The members being drawn from a limited territory, it is practicable to meet more frequently than can the larger national body, and as the conditions affecting members in general are, or can be made uniform, there is opened to the sectional association for consideration a large class of questions that could not properly be brought before the national organization. In other words, the smaller associations have opportunity to specialize.

In many instances the American Street & Interurban Railway Association or one of the departmental associations may find it desirable to try to harmonize diverging tendencies of the state associations. The interchangeable coupon ticket book presents a typical case illustrating the ways in which the associations may affect each other. Three years ago it would have been absurd to suggest that the national association consider an interchangeable ticket book. In Ohio a form of interchangeable ticket was agreed upon, and found to meet the conditions there satisfactorily, but when a few months later it was attempted to apply this on Indiana roads changes were found necessary. The interurban roads of Illinois have agreed upon an interchangeable book, and the New York state association has under consideration a recommended form. These books, while similar, differ in some details, and it seems very clear that now is the time to pass all three of them up to the national association with the object of securing agreement on a form that will be suitable for use anywhere in the country, and save roads in other sections the labor of considering this question when the need for books develops generally.

In the matter of standards for rolling stock, especially as regards those parts most often renewed, the state associations can be of great service not only to their members, but to the manufacturers. There is not now the same need for agreement on standards as would be the case were there extended interchange of equipment. However, every step in this direction means a reduction in the amount of material that has to be carried in store, and, as the manufacturer has fewer types to make; facilitates the delivery of orders.

The report of the New York association on the "Collection and Compilation of Mechanical Costs" calls attention to a point on which the Accountants' Association could co-operate with the state associations. In such matters the national association cannot take the initiative, nor can single companies accomplish much by correspondence between the annual meetings. But after fifteen or twenty master mechanics have held a few monthly or quarterly meetings, they are pretty sure to have agreed on what they want to know, and can then call upon the accountants for expert advice.

In the relations between the national and the smaller organizations here suggested there need be no dispute as to rank or precedence; all who are working in this field appreciate the advantages of co-operation, and know that what benefits a few will benefit all if they can be reached in the proper way.

SINGLE-PHASE REPAIR SHOP MOTORS.

The commercial development of the single-phase motor has been one of the most interesting and important problems of the past three years in electric railway circles. It is still too early to forecast the influences of a successful single-phase design upon the future of heavy electric traction; but in interurban service, especially in the Middle West, the single-phase motor is giving a good account of itself, and unless all signs fail, the alternating current locomotive may be expected to establish a pretty solid foundation for long distance and therefore high voltage traction.

Aside from the broader questions of policy and transportation methods which the use of single-phase electrical energy as a railroad motive power implies, a number of incidental problems are created by the use of high tension current for railway service. Conspicuous among these is the selection of motors for repair shop work in cases where the only source of supply is a single-phase generator connected to a single catenary suspension trolley wire on one side and to the track on the other. Polyphase induction motors cannot be used for shop driving under such conditions without the installation of a motor-generator and the same objection holds as to the direct-current motors which have heretofore been acceptable for driving tools individually or in groups.

Fortunately for the single-phase road the various motor manufacturers have been developing within the last five or six years an alternating-current motor admirably suited to general power service and capable of being operated on single-phase lines with even greater efficiency than direct-current motors of the same size exhibit. These machines are being extensively adopted by electric lighting and power companies with particular reference to installation in suburban territory and there is no reason why they should not prove to be extremely useful in the repair shops of single-phase electric railways.

The single-phase motor for general power service is essentially a constant-speed machine but this does not unfit it for railway shop practice on the whole. In some of the later designs effective speed control can be had between 40 per cent and full speed which means that with supplementary mechanical adjustment the ordinary repair shop requirements can be met without difficulty. On a single-phase road using polyphase generators in the power house with a sectionalized trolley distribution it might in some cases pay to install induction motors of the polyphase type in the shops, supplying them by a special two- or three-phase circuit from the power house. In general, however, the simpler plan is to draw shop power from the trolley wire, transforming the line potential to the motor voltage. The use of single-phase motors means a saving of from 15 to 50 per cent of the first cost of the motor transformer installation; except, of course, in cases where induction or synchronous polyphase motors are installed to operate at line voltage. There is also a saving in transformer losses which releases additional station capacity for power service on the cars, a reduction of from 25 to 50 per cent in the labor cost of erecting line wires, and a saving of cross-arms and conduit space. These points tend to offset the increased cost of single-phase motors over polyphase machines of equal capacity, but on a straight single-phase railway the polyphase motor is practically out of the question.

On the operating side the single-phase motor is the substantial equivalent of the direct-current motor in every respect except for variable speed work. It is capable of being started under load when properly designed and can be depended upon to furnish a wide range of starting torque without exceeding full load current by more than 50 or 75 per cent. Where a normal starting torque is required it is only necessary to close a line switch in throwing the motor into service. The single-phase motor has thus far not been made in sizes much in excess of 30 or 40 horsepower chiefly for the reason that there has not been much demand for larger ratings. Standard sizes are designed for frequencies of 60 cycles and upward, but there ought to be no special difficulty in obtaining 25 or 40 cycle single-phase constant-speed motors from reputable manufacturers. Some of these machines are sure to simplify the repair shop problem of the single-phase road at no distant date.

THE CAMBRIDGE SUBWAY BILL.

The passage of the Cambridge subway bill during the closing days of June and its signature by Governor Guild, of Massachusetts, insures within all reasonable probability rapid transit, at no very distant date, between Boston and its largest suburb. In view of the actual completion of legislative work on this transportation problem, it seems worth while to touch upon the essential transportation features just authorized.

The most important route to be laid out and constructed is the so-called Main street subway, a double-track line between the terminus of the new West Boston bridge, near Kendall Square, and the Howard Square-Brattle Square district, via Main street and Massachusetts avenue, a distance of about 2.5 miles. The Boston Elevated Railway Company is authorized to build this subway under the supervision of the Massachusetts Railroad Commission, and at any time after the expiration of 20 years from its opening for use, the subway and its equipment, including stations, inclines, etc., may be purchased by the city of Cambridge from the company. Four years is named as the time for completion of the work, dating from the final approval of the company's original plan by the city.

The company is also authorized to build, if it so desires, other subways in Cambridge beginning within four years of the completion of the Main street line.

One of the most interesting features of the act is the provision made for connecting the Main street and the Cambridge street subways with the transportation system of Boston proper. Two routes are presented to the Boston Transit Commission for choice and construction between the West Boston bridge, which is the easterly terminus of the Main street subway, and the business district of Boston. The first is a subway between the vicinity of North Russell street, near the West Boston bridge, under Cambridge street (Boston), to Scollay Square; the second, a tunnel between Park street subway station, under Beacon Hill, between Pinckney and Cambridge streets, to the vicinity of the bridge. In case of an appeal by the company the Railroad Commission is to decide the question of routes. The construction of the latter in Boston is to be carried out by the Boston Transit Commission.

The Cambridge street subway (Lechmere to Howard Square), if built, is to be connected with Boston by an elevated railway route over the down-stream slope of the new Charles river dam, the tracks to be finally connected with the existing subway and the Washington street tunnel system in the vicinity of Causeway street.

The act provides a comprehensive knitting together of Cambridge and Boston which has long been needed. Traffic between these two communities at the present time is handled by surface cars running over Howard bridge, the old West Boston bridge or the Carnegie bridge. Serious obstacles to rapid transit exist on all three of these routes, either on account of the congestion of traffic or the receiving tracks in the Back Bay district, complicated as it is with the concentration of cars from Newton, Brookline and cross-town points; intricate topographical conditions, involving a departure from air-line routes through the streets most directly in line with the terminals; or on account of important engineering construction in connection with new bridges or their equivalent. The present running time between Howard Square, Cambridge, and Park street subway station, Boston, is about 25 minutes. The completion of the Main street subway will doubtless make possible a schedule of 8 or 9 minutes.

RAPID PROGRESS TOWARD ELECTRICAL OPERATION IN CHICAGO.

Since the ordinances permitting the Chicago City Railway Company and the Union Traction Company to equip their cable lines for electrical operation were passed by the city council, the building of the new overhead system has advanced rapidly. The Chicago City Railway has in all about 35 miles of cable track which by fall it expects to have converted for trolley operation. The State street line at the present rate of progress should be in operation by August 1. As soon as the trolley work is completed on the State street line and material can be obtained, the overhead will be erected on the Cottage Grove avenue line.

On Monday, July 1, a large force of men started setting poles on State street, the plan being first to complete the overhead work between Archer avenue and the cable loop at Madison street. By the second day a sufficient number of poles had been placed to support the trolley wires on State street from the intersection of State and Eighteenth streets with Archer avenue to and around the loop at Madison street. During the daytime this section of State street is very crowded, and for this reason the larger part of the work of erecting poles was carried on at night.

The poles on State street are of the "5-6-7" tubular steel type weighing 900 pounds each. The line of poles on either side of the street is just inside of the sidewalk line. This location makes the task of pole-hole digging an expensive one. The location of the poles is such that it is necessary to dig many of the holes for their entire depth, 6 feet, through solid concrete. The construction work is being carried on under the guidance of the Commissioner of Public Works and trolley poles are being placed at intersecting streets and alleys so that if the city authorities desire they may be used as supports for street lamps. Each pole is set upon a butt block and given a rake of 6 inches away from the street centre. The space about the poles is then filled with concrete up to the sidewalk level.

A No. 00 hard-drawn copper wire is supported on ⅜-inch double galvanized span wires. The spans are fastened to the poles with Brooklyn strain insulators. Insulated trolley hangers are used and a third insulation between the trolley and the ground is inserted in the span wire. The wires are held at a height of 21 feet above the street.

At the present time the new trolley wire inside the loop district will be fed from the existing feeder network. Later on when more current is needed for new cars and heating purposes it will be necessary to erect direct-current feeders which will be placed on cross-arms at the tops of the steel trolley poles. The existing cable tracks are cast-welded and the special track work is bonded so that as fast as the trolley wire is erected cars can be electrically operated.

The situation of the Chicago Union Traction Company with regard to the construction of trolley wires over its existing cable tracks is very similar to that described for the Chicago City Railway. The type of overhead equipment which is being erected for the North and West side lines is, in general, the same as that used on the South side lines. Electric cars are now being operated on Adams street from Fifth avenue to State street, Dearborn street from Randolph to Van Buren street and Harrison street from Dearborn to Fifth avenue. It is expected that the Blue Island avenue line from Leavitt to Twelfth street will be ready for electrical operation by July 18. On this line it is necessary to erect about 20,000 feet of trolley wire. When this work is completed the present Blue Island avenue cable line can be electrically operated from Western avenue to the down-town loop at Adams street. After the Blue Island avenue line is in operation the construction work on the Madison street and Milwaukee avenue lines will follow. A large part of the Wells street and the North Clark street cable lines have been equipped for trolley operation for some two years so they can quickly be converted. The following data regarding the amount of electrical construction which the Chicago Union Traction Company is planning to complete as fast as material is received, may be found of interest:

The North side cable lines on Clark, Wells, Center, Division and Clybourn avenue which will be equipped with trolleys have a total single-track length of 59,248 feet. The four business district turning loops, three of which are now single-track cable lines and will be converted to double-track trolley lines, have a total single-track length of 7,454 feet. Combining these the total single-track mileage on the North side is 12.63 and the total street mileage is 6.44.

On the West side the Blue Island, Madison, Armitage and Milwaukee avenue lines will require overhead construction for 80,194 feet of single-track line. The turning loops for these lines in the business district, five in number, which are now single-track and will be double-tracked, will require trolley construction for 12,300 feet of single track. Thus, on the West side it is necessary to erect 17.52 miles of trolley construction measured as single track, in 8.8 miles of street.

There are now 1.42 miles of single track, either dead or operated by horses, which will be equipped for trolley operation. This latter mileage, with the 30.15 miles of single-track cable line which will be electrically operated, makes 31.57 miles of single track which the Chicago Union Traction Company will make ready for adding to its present electrically operated lines.

A Useful Form for Reporting Defective Cars.

The Chicago & Joliet Electric Railway has a simple form on which motormen may report defects in equipment sent to the repair shop. By using this form the making out of the usual trouble report is much simplified.

The card is 5½x11 inches in size. It bears two parallel columns containing the general heads of motors, electrical equipment, trolleys, wheels and axles, fenders, brakes, trucks, car bodies and airbrake troubles. Under each of these heads are listed the defects that commonly occur in that particular portion of the car's makeup. By the side of the list of defects appear two blank columns intended for the use of the motorman and the car-barn foreman. At the top of the card are spaces for the car number, the date and hour of the occurrence of the trouble, the division of the road, the nature of the trouble and the signatures of the motorman and conductor.

When a car is sent to the repair shop the motorman places a cross in the first column of the card opposite the name of that part of the equipment which is defective. He then turns the car over to the barn foreman who sees that the necessary repairs are made and places a cross in the second column signifying that the work has been done, affixes his signature at the bottom of the report and hands it to the master mechanic. On the back of the report are spaces for remarks.

PUBLIC SERVICE BUILDING OF THE MILWAUKEE ELECTRIC RAILWAY & LIGHT COMPANY.

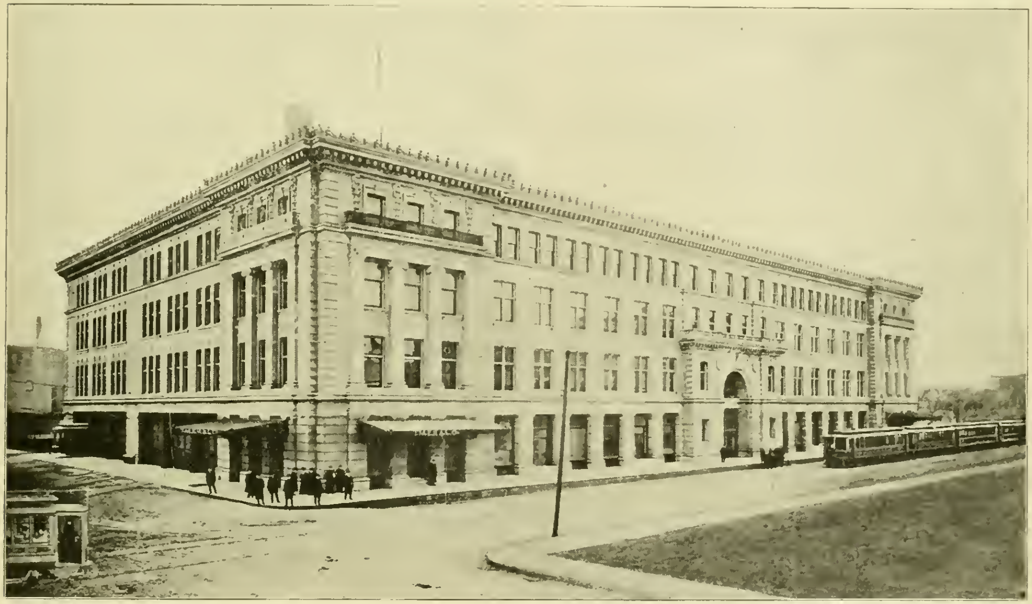
The Milwaukee Electric Railway & Light Company has just completed an especially fine public service building and interurban terminal station. The construction of such a building was warranted by the expansion of the business of this company and its rapidly increasing interurban mileage; active construction work is now in progress which, when completed, will increase the interurban mileage some 300 miles. The new building offers generous quarters for all departments of the operating organization as well as affording an excellent terminal for the various interurban lines radiating from the city. It is located near the centre of electrical distribution for the city and a portion of the basement is used as a generating station. An especially interesting generating plant, which will be described later, is in process of installation.

The new building, which is the business centre for the entire holdings of the company, stands near the center of the city of Milwaukee. It covers a rectangular ground space of 200x320 feet, bounded by Sycamore, Everett, Second and Third streets. In planning the building provision was made for the future growth of the company's business. The present accommodations, it is believed, will be found ample for a number of years to come.

The walls of the new structure consist of a steel frame filled in with light gray brick and cut stone trimmings. It is four stories in height, but the steel framework and foundation are designed for supporting 12 floors. The columns now extend a short distance above the roof over the fourth floor and are capped in such a way that when conditions warrant the steel work for eight more floors may be added.

In general the type of construction is that used in the high-class public buildings of the larger cities. As has been stated the walls are of very substantial construction. The steel work supporting the floors and walls is encased in concrete and the floors and interior walls are made of reinforced concrete.

The interior finish of the entrance and main hallway is highly artistic in effect. This hall is two stories high and its walls and the stairways leading to the floors above are of white marble. The entrance floor is covered with interlocking rubber tile while the corrider floors throughout the building are light-colored stone. The wall surfaces are tinted and frescoed to offer a pleasing appearance. With the exception of two suites the woodwork throughout the building is of curly birch and the offices are floored with narrow matched hardwood. Specially designed heavy bronze hardware was used for all hinges, locks and similar fittings. The railings to the stairway and the elevator grills are of similar material.

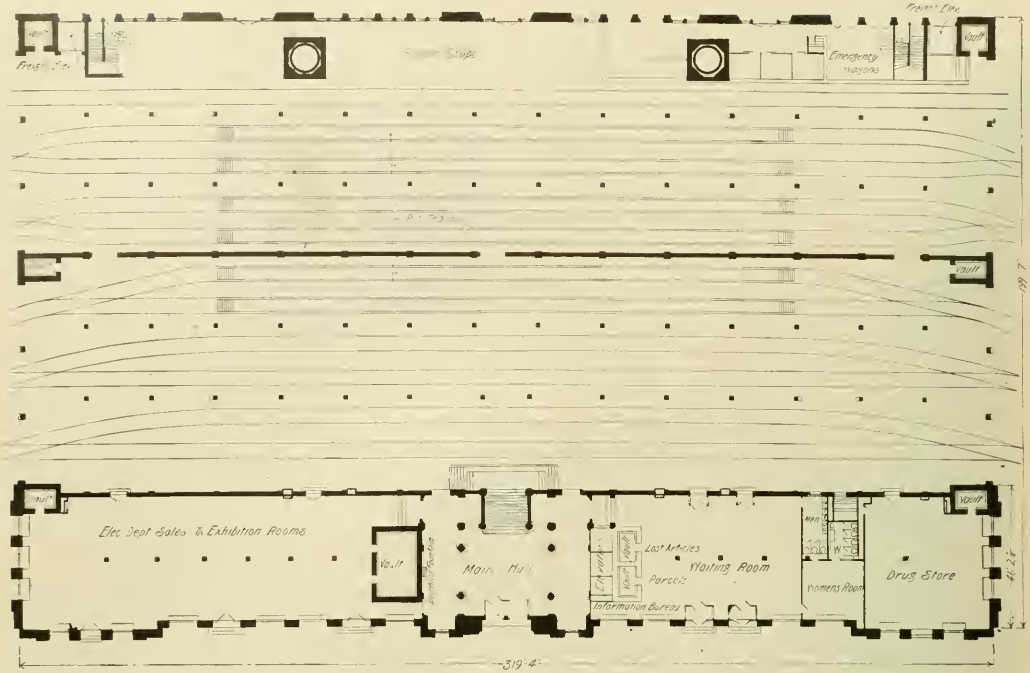


Milwaukee Public Service Building—General View from Corner of Second and Sycamore Streets.

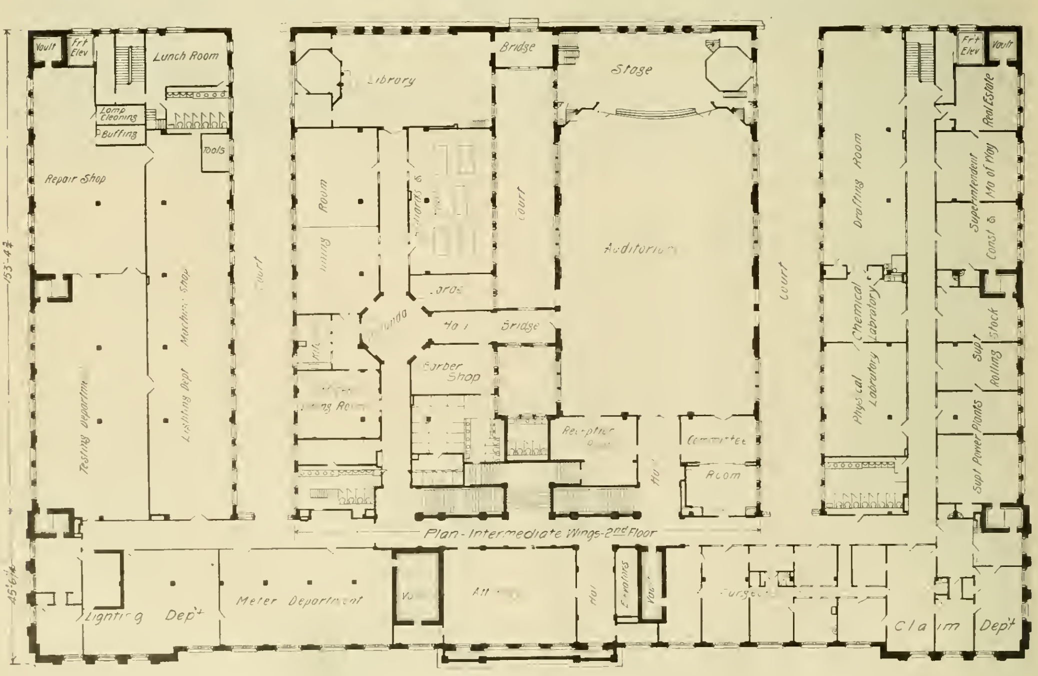
First Floor.

The two accompanying floor plans will serve to illustrate the general arrangement of the suites of offices and show the accommodations afforded by the new building. It will be noted that the larger portion of the first floor is set aside as an interurban car house and terminal. The 11 tracks extending through the building will accommodate 70 city and interurban cars. Six of these tracks have pits so that cleaning and light repair work for all the interurban rolling stock of the company may be carried on here. Close to these tracks and extending along the south side of the building is a space which will be fitted up for light car repair work. At the southwest corner of the building accommodations are afforded for trolley emergency wagons and their horses, or automobile emergency cars, which it is expected will be substituted later; also ample storage space for line repair supplies and tools.

The rails of the pit tracks are supported on concrete walls and the pits have concrete floors with steps at the ends leading up to the general floor. The space between the pits was so excavated that room is afforded for storing a large amount of coal which may be handy for car heating. A por-



Milwaukee Public Service Building—Plan of Ground Floor.



Milwaukee Public Service Building—Plan of Sections of Second and Third Floors. Exterior Wings Show Offices on Third Floor. Interior Portion Shows Recreation Rooms.

tion of this space is also used for sand storage. In the floor between the pit tracks are bullseyes so that the coal or material stored between the pits can readily be removed. Extending at right angles to the tracks and below the car house floor are three concrete gangways, one at either end of the building and one across the middle. These transverse openings afford passageways for repairmen desiring to go from one pit to another, and also form a part of the drainage system of the pits. The floor of the car house is of cement troweled to a smooth finish even with the tops of the rails, which are of 6-inch 72-pound T-section. The openings at the ends of the building are provided with heavy plank doors. Two such doors are joined with very strong, specially designed hinges making a double folding door. This combination is not supported on hinges, but the door nearer the side framing has, as a part of its structure, a 4-inch gas pipe which forms a turning post for the combination of doors. This post is reinforced on one side by a quarter-inch thickness of wrought iron and it turns in roller bearings secured in the floor and in the door framing above. With this construction the double-folding doors are made to operate very easily and yet be so rigid that the farther door will not sag and bind on the floor.

Milwaukee Public Service Building—Main Entrance Hall.

Through the center of the car house, from end to end, is a fire wall separating this section of the first floor into two parts. It is expected that the tracks of the part nearer the offices will be used as working terminal tracks for interurban cars in regular operation.

Adjacent to these tracks and along the north side of the building is a row of offices each of which is 46 feet wide. At the east side of the building is provided space for the lighting department of the company, which has already equipped this space for sale and exhibition rooms and the several lesser departments which the customers frequently visit. At the center of this north section of the first floor space is the main entrance hall at the rear of which is a marble staircase leading to the second floor. On the right of the main entrance are the elevator shafts. Still farther to the right are the terminal waiting rooms with entrances from the hall, the street and the terminal track floor. These rooms are well fitted for the purposes which they will serve. They have a large seating capacity. There are small adjoining rooms for an information bureau, lost articles and parcel-checking departments, also lunch room and news-stand. A floor space of about 1,600 square feet at the corner adjacent to the waiting rooms will be leased for a drug store.

Offices on Second Floor.

The accompanying illustrations show the arrangement of the interior divisions of the central portion of the building on the second floor and the side and front portions of the building on the third floor. On the second floor at the east end of the building are accommodations for the auditing department. The floor space for this department is 65x160 feet. The auditing department has access to four fireproof vaults adjoining the walls of its rooms and there are also ample toilet facilities nearby. A room in one corner of this department has been fitted up with chairs and tables for a lunch room. At the front part of the building and adjoining the auditing department are the quarters of the accounting department. The accommodations for this department consist of a general office and several smaller offices. The west half of the front portion of the second floor has been sub-divided for the accommodation of the transportation department. For the superintendent of transportation and his assistants there are one general and three private offices. Adjoining this suite is the telephone office. The interesting telephone apparatus in this office will be described later. Adjoining the telephone office is a room for

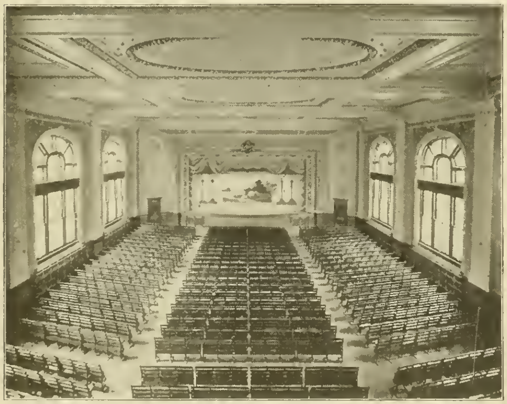
Milwaukee Public Service Building—Accounting Department Showing Lighting Arrangement.

the division foreman and this room connects through a wicket with the trainmen's quarters. There has been provided for the use of trainmen a general room 45x14 feet in floor area fitted with tables and chairs. Opening from this room are the conductors' and motormen's locker rooms. Here are several hundred steel lockers arranged in rows two stories high with a mezzanine floor served by a short steel staircase. A special room is provided with partitioned tables where conductors can count their cash. Half of the west wing of the second floor is yet unoccupied. The other half is fitted up with three regulation bowling alleys and one "pony" bowling alley. Adjoining one end of the bowling alley room there is a room set apart for lost articles, and centrally located in this part of the building are ample toilet facilities.

Recreation Rooms on Second Floor.

As shown in the accompanying illustration, the central portion of the second floor, separated from the exterior wing of the building by courts, is planned to afford especially generous accommodations for employes' club rooms and a large auditorium with modern stage equipment.

The auditorium, with its stage and reception room, occupies a floor space of 65x155 feet. The floor is on a level with the second floor of the building while the ceiling is a continuation of the ceiling of the third floor so that there is a balcony space on a level with the third floor. This auditorium with its portable seats has a seating capacity for 1,100 persons. The rows of chairs are fastened together so that when it is desired the floor space may be easily cleared for dances. The auditorium is decorated in an especially pleasing manner and well lighted by 12 chandeliers. An entrance hall connects the auditorium with the long corridor extending through the second floor of the building. On either side of this entrance hall are small rooms which may be used as reception or committee rooms. The stage, extending across the entire width of the auditorium space, is about 30 feet deep. There are three tiers of fireproof dressing rooms at either end of the stage and and stage fittings throughout are very complete. The large curtain is arranged to be raised and lowered by an electric motor and several steel platforms and stairways lead from the dressing rooms to the flies and the stage. In case it is desired to dismiss the audience quickly there are available nine exits to the open courts and to the main corridors of the building. As it was not easily possible to pitch the floor of the general auditorium the stage was given a slope of 1 in 15.



Milwaukee Public Service Building—Auditorium and Stage.

Across the central court from the auditorium and connected with it by two bridges is that portion of the building set apart for the employes' club rooms. This division of the building is 155 feet long by 65 feet wide and is divided into a number of rooms arranged around a central hall with a rotunda in the middle. At the south end of this group of rooms and extending across the entire width of the building is the library and general reading room furnished with many tables and a large equipment of steel book stacks arranged in two tiers. The upper book stacks are reached by an ornamental stairway leading to a mezzanine floor. Adjoining the library on the east side of the recreation rooms is a large dining room space which by means of rolling partitions can be divided into three rooms. Next to the dining room is the kitchen with its up-to-date equipment of gas and electric ranges. Adjoining the kitchen on the north is an attractively finished dining room which will be used by the officers and heads of departments. Adjoining this dining room is a space fitted with boxes for a check room. Across the central hall from the larger dining room is a billiard and pool room with six tables made of curly birch to match the interior decorations of the room. This room has a stone floor. Next to the billiard room is a smaller room set apart for cards and games. Another room opening on the rotunda or lobby will be furnished as a barber shop. Adjoining the barber shop is a bathroom with 15 baths. The remaining portion of this section of the building is equipped with toilet facilities.

Milwaukee Public Service Building—General Manager's Office.

Third Floor Offices and Lighting Department.

The arrangement of the rooms in the exterior section on the third floor is shown in the illustration, which also shows the theatre and club rooms on the second floor. The east wing of the third floor is occupied by the lighting department and sub-divided and equipped to suit its needs. At the southeast corner is a repair shop for lamp work. A part of this shop was separated by partitions into two smaller rooms, one with several sets for motor-driven brushes designed for cleaning lamp globes, and the other room equipped with motor-driven emery and buffing wheels for finishing small lamp parts. In front of the repair shop is a room about 70 feet long and 35 feet wide which is occupied by the instrument-testing department. Along the street side of this room is a large black slate testing board equipped with special instruments, switches and mountings for making accurate tests of customers' meters and all lighting and power instruments. Adjoining the testing and repair rooms is a machine shop 27 feet wide and 115 feet long. The equipment in this shop includes 7 lathes, 7 drill presses, tapping machine, punch, 2 milling machines, 6 grinders, rotary shears, 3 gas forges and a shaper. One corner of the room has been partitioned off for the foreman's office and a tool room. It is interesting to note that the attention to details shown throughout the entire building has been followed by making the tool cases and wooden fittings in the machine shop of the same wood, curly birch, which was generally used for the interior finish of the offices. At the rear of the machine shop is a toilet room and between this toilet room and the south end of the building a room has been furnished with lockers for the employes of the lighting department and with tables and chairs so that lunches may be eaten here. At the northeast corner of this floor is a suite of offices for the chief electrician and superintendent of the lighting department. Adjoining these offices are accommodations for the assistant superintendent. At the front of the building and nearing the offices of the lighting department are the general rooms for the clerks of this department and a large room especially designed to facilitate the work of the meter department. Convenient to the entrance of the meter room is a long counter under which pigeon holes and lockers have been built. The pigeon holes are open on both sides of the counter and are of a suitable size to accommodate the books of the employes who read meters. Each such employe has allotted to him by number one of these pigeon holes, and a large locker directly underneath with a locked door opening to the outside of the counter and an open side toward the office. After meters have been tested and approved they are brought to this department where the clerks tag each instrument with instructions and set it in one of these lower lockers so that the installation man may get the meter and instructions from the outside by opening his own locker. Thus the work of the clerical department will not be continually interrupted by installation men making inquiries for meters to be hung or meter books in which to record their readings.

Milwaukee Public Service Building—Interurban Waiting Room.

Adjoining the meter department is a room which will be suitably furnished for the use of the attorneys of the company. Next to this is the hall and entrance to the elevator shafts. To the west of the hall and opening on the main corridor is the suite of rooms for the surgeon. In this suite are a general reception room, a private office for the surgeon, an operating room equipped with all modern appliances and instruments and several small compartments for dressing injuries. It will be noted that this department is very complete and that excellent provision has been made for handling emergency cases. A trained nurse is on duty here at all times.

Adjoining the surgeon's rooms and at the northwest corner of the third floor are the rooms of the claim department. This department has six rooms in all, consisting of a general reception room, a private office and five smaller rooms. Next to the claim department and on the west side of the building are general and private offices for each of the following heads of departments: superintendent of power plants, superintendnent of rolling stock, and superintendent of construction and maintenance of way. At the south side of this wing, connecting with the private office of the last named superintendent, is a room set apart for the civil engineer and real estate men.

Opposite the office of the superintendent of power are the physical and chemical laboratories. The physical laboratory will include in its equipment an autographic testing machine for testing the tensile strength of materials, a machine for making physical tests of oils and bearing metals, a transverse cement testing machine and an automatic cement testing machine for obtaining records of the tensile strength of cements. The chemical laboratory will contain apparatus for making analyses of various materials used by the construction department of the company and for indicating calibrations and coal calorimetry.

Opposite the office of the superintendent of construction and maintenance of way and the real estate office is a large drafting room extending for half the length of this wing of the building. In this room are 25 adjustable drafting tables and a large equipment of steel filing cases specially designed for storing tracings, prints and profile rolls.

Printing Department.

At the southwest corner of the fourth floor is the printing department well equipped to do the larger portion of the printing required throughout the system. In this department are a Miehle press which can handle sheets 22x48 inches in size, two small presses, one for heavy embossing work, a two-color press with perforating and numbering attachments for tickets and transfers, a numbering machine, a large ruling machine for accounting department forms and a 40-inch Seybold paper cutter.

Milwaukee Public Service Building—Operating Room in Surgeon's Department.

General Manager's Offices.

At the northwest corner of the fourth floor are the private offices of the general manager. This suite includes a general office, a private office, a bathroom and a stenographer's office. Entrance to the general manager's office is had through a vestibule waiting room lighted by an ornamental art glass skylight. The general manager's suite is finished in fumed oak and is appointed in an especially fine manner with artistic decorations and furniture made to suit the general decorative scheme. Adjoining the general manager's suite on the south is the directors' room. This room is finished in mahogany, and furnished with a mahogany table extending its entire length and 30 solid mahogany Bank of England chairs. Adjoining the general manager's suite on the east are rooms for his confidential clerk who has charge of the purchasing. There are also accommodations for a number of clerical assistants needed in the purchasing department. The remaining portion of the fourth floor is as yet unoccupied, but it is contemplated that one wing on this floor will be equipped for a gymnasium and training room for platform men.

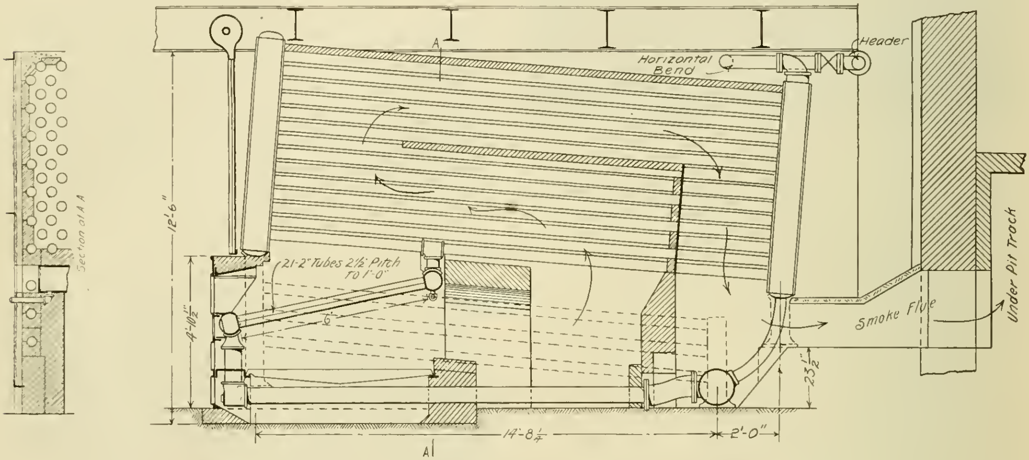
Auxiliary Services.

It is interesting to note how completely the detail arrangements for the comfort of the employes and for facilitating their various tasks have been considered in building. Drinking water is brought to the building each day from a spring at Waukesha owned by the company. This water is stored in two 10,000-gallon concrete tanks in the basement. Before it is distributed to the numerous drinking fountains located in the halls and offices the water is cooled by a 28-ton capacity Velter refrigerating machine. Pressure for the circulation of the cooled water is furnished by two motor-driven centrifugal pumps located in the basement, and by-passes at each of the drinking fountains connect with a return piping system so that the cooled water is always in circulation and does not become warm by standing in the ends of the pipes. The refrigerating machine also furnishes the refrigeration necessary for the kitchen and lunch counter.

A continuous supply of compressed air is furnished by two 150-foot capacity, motor-driven Christensen air compressors. A large part of the output of these compressors is used for operating the pneumatic tube service which connects all the various departments. A portion of the compressed air is used in the Johnson heat-regulating service which controls, by means of thermostats, each steam radiator in the building. The compressed air is also used at about 80 pounds pressure for the blast forges in the machine and repair shops.

For cleaning the building a vacuum piping system has been installed. Vacuum is maintained by two steam-actuated aspirators. This piping system extends to all parts of the building with taps in the rooms so that connection may be made with sweepers and other suitable tools designed by the American Cleaning Company of Milwaukee. These tools suck in the dirt and dust as they pass over the floor and furniture, then by means of the 10-inch vacuum which is maintained, this dust is carried to separators in the basement where it is removed.

There are four elevators in the building, two of which are used for passenger service and two for freight. The passenger elevators were built by the Barth Elevator Company of Milwaukee. They have a speed of 500 feet per minute, with a capacity for 2,500 pounds load. There is a shaft for the installation of a third passenger elevator. The freight elevators have a speed of 250 feet per minute and a capacity for handling loads of 4,000 pounds. There are also two sidewalk hoists connecting the basement floor with the street level and a similar hoist between the basement and the first floor of the car house. All the electrical equipment is operated by electric motors taking power from a 220-volt, direct-current circuit. The elevator doors are pneumatically operated.



Milwaukee Public Service Building—Sections Through Boiler and Boiler Setting.

Fire protection on the car house floor, the theatre stage and in the storerooms of the lighting department is furnished by 2,000 Grinnell heads supplied with water from two 6-inch city water connections, and also by a 2-stage Lawrence centrifugal firepump operated by an 80-horsepower G. E. underwriters' motor. In case of fire this pump may be connected as a booster to the city water pressure or take its suction from three 10,000 gallon concrete tanks in the basement. One of these tanks is for holding water for general purposes and the other two have already been mentioned as supplying the drinking water. In connection with the sprinkler system there are many hose connections and coils of fire hose ready for immediate use. There are four such fire connections with hose on the theatre stage.

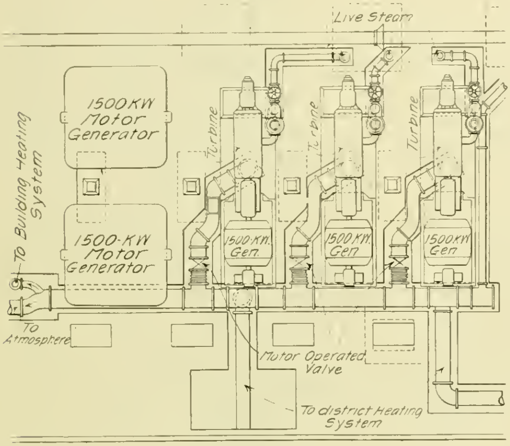
As the basement floor is considerably below the general sewer system of the city six sumps have been provided each with a motor-driven pump for furnishing drainage.

The various departments throughout the building are connected to a central office by a system of pneumatic tubes. At this office is an operator who, on receiving a pneumatic carrier from any office, can dispatch it to any other office in the building. By the use of this system it is possible to transfer papers or small packages between the extreme corners of the building in 10 seconds.

Throughout the entire building there are in all 39 electrically-controlled clocks connected with a master clock in the train dispatcher's office. In this room there is also a large clock connected with the Western Union time service and corrected hourly. As will be noted from the floor plans each department has a fireproof vault, there being 59 such vaults located in the various parts of the building.

Telephone Systems.

Four complete telephone systems are installed in the building, the lines ot any one of which are absolutely interchangeable with those of the other systems. These four telephone services are the Bell city system, the Public Service building manual system, an automatic system and the dispatcher's circuits. The telephone central is located in the same room with the interurban train dispatcher's board. The telephone operator's board has a capacity in one position for 140 subscribers' lines and 40 transfer connections from the dispatcher's board to this position. There are 19 Bell and one automatic trunk line connections. The one-position, with 140 lines, is now completed, and the other ready for installation as the service demands. The dispatcher has 40 lines on each position of his board, with facilities for transferring the calls to the manual board.



Milwaukee Public Service Building—Plan of Turbine and Motor Generator Room in Basement.

There are 40 automatic desk instruments installed in the various departments, by the use of which it is not necessary to have a third person on the line. Each of these automatic instruments has the ordinary Bell type of receiver and transmitter and on the desk where each instrument stands is a two-position key, so that either the automatic or the manual system can be used with the same instrument. To make this possible some interesting electrical details were necessary, among which was the adjustment of the voltages of three telephone systems to a common potential of 52 volts. Current for ringing is provided by motor generator sets operating in connection with two batteries of storage cells, one of which is held in reserve. The various currents for the telephone systems are controlled by instruments mounted on a marble board near the train dispatcher's desk. The trunk line from the manual board to each department is carried to the desk of the chief clerk, who gets the incoming ring and connects the caller with the proper member of the department force. In this way the heads of the various departments are not disturbed by answering calls not intended for them.

Lighting.

The lighting arrangement for all the rooms was especially well planned. There are no desk or spot lights in the offices, but illumination is furnished by 100-candlepower incandescent units supported by single-light fixtures uniformly spaced below the ceiling.

All the machinery in the building, such as the presses and cutter in the printing department, the lathes and other tools in the machine shop, the various air-compressor pumps, etc., in the basement, are electrically operated by direct-connected motors. The wiring system of the entire building was laid out before the floor and walls were completed and conduits laid in the concrete structure for all connecting cables and wires, so that there are no extension cords and unsightly wires visible. Wherever it was thought probable that a desk might be set, a floor-connection socket was installed.

Power Station.

As the Public Service building has such a central location with respect to the distribution net-work for the entire city, advantage was taken of the basement floor space available and preparations made for installing a very complete generating station.

Boilers and Auxiliaries.

Along the south side of the basement is a battery of ten 500-horsepower Edgemoor water-tube boilers with Hawley down-draft furnaces. The boilers are of special design, as will be noted by reference to an accompanying section of the boiler with its furnace. Owing to the small headroom, 12 feet 9 inches, no drums form a part of the boiler but live steam is taken out of the rear water leg. A special construction has been used for the boiler setting. The details of this construction are shown by a section taken across the boiler just back of the firebox. In order to economize floor space the boiler lagging was made of the special tile shown in the illustration. These blocks are of suitable size to fit around and be supported by the outside vertical rows of tubes. A thin coat of fireproof lagging is placed over the outside of the tiles. By means of this novel method of boiler setting the customary brick wall is done away with and a satisfactory insulating covering, but 7 inches thick, is provided.

There were two reasons why stokers were not installed but the practice of hand firing adopted. First, with the very limited headroom it was thought that with stokers the tuyeres would be so close to the boiler tubes that the local heating effect would become too severe; second, on account of the arrangement of the coal storage bin under the sidewalk there is necessity for one handling of the coal, and therefore it would hardly be any more economical to shovel it into the stokers than to feed the furnaces by hand. The coal is delivered to a storage bunker under the sidewalk through bullseyes built in the street, so that wagons may be dumped through them, or coal may be dumped from the cars of the electric railway system. As the ashes are removed from the pits they will be transported to an elevator by a telpherage system extending along the front of the boilers. At one end of this system is an elevator which will raise the ashes so that they can be discharged into cars standing on nearby tracks.

In connection with the boilers are two 1,500-horsepower capacity Hoppes heaters and two duplex, outside packed Worthington pumps with dimensions of 14 and 8½x5 inches. No condenser equipment is provided, as it is proposed to use the exhaust steam from the turbine equipment in the district heating system already installed. The boiler feed water will consist largely of returns from the heating systems, which will all be discharged to two concrete hot wells below the basement floor level. By means of an automatic regulator a constant level will be maintained in the hot well, using make-up water from the city mains. Water will be pumped from the hot well to the open heater by two 3-inch, motor-driven, Lawrence centrifugal pumps. It is thought that a very small amount of make-up water will be drawn from the city mains, because the water which is used in the refrigerating system to cool the compressed ammonia will be led to the hot well. This practice should be economical, since the ammonia cooling water has been heated already, and because when discharged to the hot well this water will be moderately warm.

The boiler feed piping system consists of a duplicate line of feed pipes from the two duplex pumps which take water from the Hoppes heaters. Each of the 10 boilers has a connection with both of the two 7-inch boiler feed lines upon which the duplex pumps maintain pressure. Each of these feeding systems has capacity for serving all the boilers, and a constant water level in each boiler will be maintained by a Squires regulator on each inlet.

After having made their several passes through the tubes the gases leave the boiler under the rear water leg and pass through the building foundation wall illustrated with the section of the boiler. The smoke flue which connects the boiler breeching with the two 150-foot stacks is rectangular in section and extends horizontally throughout the length of the building and directly under the repair pit of the south car house track. The flue is made of blast furnace slag concrete with proper steel reinforcements. The flue is of suitable sectional area to suit the 9-foot diameter of the stacks.

Piping.

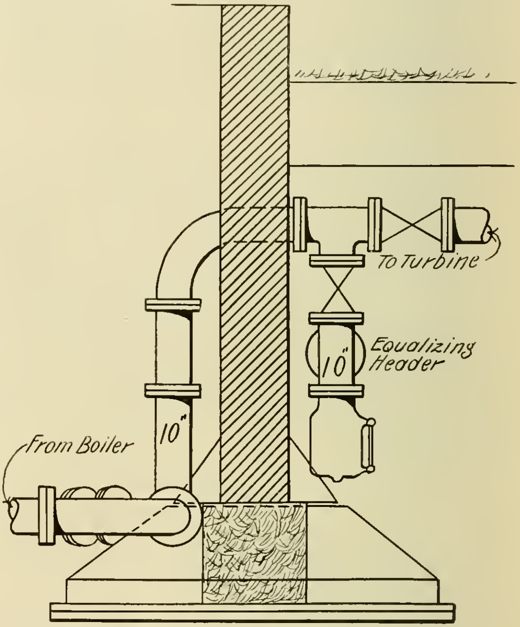
Owing to the exceptionally small headroom and the relative arrangement of the boilers and turbines several interesting details were necessary in the main steam piping. The steam outlet of the boiler is at the top of the rear water leg and here a 90-degree flanged elbow is placed so that a horizontal U-bend connects through the shut-off valve with a header parallel with and back of the boilers. As there are 10 boilers in the battery it was impossible to group them in equal numbers, but the arrangement adopted consists of short headers connecting two sets of three boilers each and one set of four boilers. From each of these headers, which are independent of one another, a 10-inch steam main extends to an equalizing header close to the turbine units. The subdivision of the battery boilers was so arranged that the set of four boilers feeds to the equalizing header through the shortest length of pipe line, and therefore if an excessive demand is made upon the short pipe line there will be a capacity of one more boiler to meet it than are connected with the longer steam mains.

The three mains from the headers at the boilers pass just below the car house floor and are hung from the I-beams forming a part of the floor. These three pipes pass through the walls of the six car repair pits. Near the point where they connect with the equalizing header a complicated high pressure piping detail was required. The conditions to be met and the arrangement of the parts are shown in the accompanying sketch. It will be noted that the three live steam mains from the boilers make two right-angle turns at the partition wall and pass through without further bends to the turbine units. Just inside of the turbine room each turbine connection has a T in it and a valve below. In this way connection is made with an equalizing header parallel with the partition wall shown, and the steam pressure from the three groups of boilers is equalized. The average length of the piping between boilers and turbine units is 250 feet.

Turbine Generating Units.

The three generating units, as illustrated in the plan view, consist of non-condensing Allis-Chalmers turbines of the Parsons type, each driving a 1,500-kilowatt capacity, 60-cycle, 2,300 to 4,000-volt Allis-Chalmers alternating-current generator. The turbines are not of the standard design, but were specially built to be run non-condensing. The builders of these turbines guaranteed their steam consumption per kilowatt-hour, with an absolute back pressure of 22 pounds, to be 44 pounds at three-quarters load, 40 pounds at full load and 41 pounds at one-quarter overload. The turbine equipment is designed to be run only when steam is needed for the heating system and the current output of the turbine-driven generators will be fed into the lighting network. An exhaust trunk for the three units is provided with a vertical atmospheric pipe built in one of the partition walls. The exhaust trunk is directly connected with the district heating system through two 24-inch underground steam mains.

In order to make this installation more flexible and permit of equalizing the load between the direct and alternating current distribution networks, two motor generator sets will be installed close to the turbine units. Each of these motor generators will consist of a 1,500-kilowatt motor with the same characteristics as the turbine generators, mounted on the same shaft with a 300-volt direct-current generator. The installation of this motor generator equipment was made necessary because at the time the machinery was ordered it was not commercially possible to purchase a 1,500-kilowatt direct-current turbine unit, and reciprocating engine units could not be used because of the continual jar which they would distribute to the building above them.



Milwaukee Public Service Building—Piping Details at Partition Wall, Showing Arrangement of Steam Mains, Header and Turbine Connections.

The alternating-current generators are designed with an enclosed armature casting, so that the usual humming during operation will be greatly lessened. Each generator is wound with 4-wire, 3-phase circuits with 2,300 volts difference of potential between any leg and the neutral.

Storage Battery and Switchboard.

A storage battery of 320, type G 39, chloride accumulator cells, has been installed in one section of the basement. The busses from the various rows of cells extend through a concrete partition wall, so that a motor-operated end-cell switch device is outside of the battery compartment. All the busses connecting the various rows of storage battery cells are made of copper bars mounted on edge and having a sheet lead roof. All the copper parts are very thoroughly covered with vaseline, which, in connection with the sheet lead, prevents the destructive effects of the battery fumes.

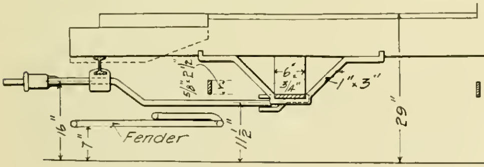
Close to the turbine motor generator room is the switchboard for controlling the output of the generators used and for general control of the various service wires in the building. Special care has been taken in the construction of this board to make it very complete, so that it will serve as an exhibit. All the busbar connections on the rear of the board are special castings, each designed to suit the particular needs at its location. In this way much unsightly bent work is done away with. As a part of the board there are standard switch panels for the turbines, motor generator sets for a battery booster and feeder panels for tie lines to other generator stations, for connecting the storage battery to the 3-wire direct-current network and a panel for each floor of the building, with special panels for the theatre and test departments. The generating equipment and distribution panels of this installation may be directly connected with the Commerce street generating station of the Milwaukee Electric Railway & Lighting Company through 24 feeders which have 2,000,000 circular mils cross section. The light circuits for the Public Service building have double-throw switches, so that any circuit may be connected with either an alternating-current or a direct-current buss. The theatre has both direct and incandescent circuits, which may be operated at the same time, and therefore should one circuit be interrupted a plentiful illumination will still be available.

Pipe Shop.

Close to the power installation and the room which contains the auxiliary apparatus is a pipe shop, where it is proposed to manufacture pipe fittings and complete the piping details for the various work of the company. In this shop are a large number of storage bins, three Bignall & Keeler pipe cutting machines, one with a capacity for 12-inch, one for 4-inch and one for 2-inch pipe; also 4-inch and a 10-inch Baker tapping and facing machines, tool grinder, pipe bender and a complete equipment of necessary smaller tools. All the machines in this department with the exception of the pipe bender are driven by direct-connected electric motors.

NEW CARS FOR BUFFALO.

The first of the new cars for the International Railway Company of Buffalo, 150 of which are building by the G. C. Kuhlman Car Company, of Cleveland, was put in service May 27, and up to July 1, 18 have been received. These cars are similar to those designed for the Chicago City Railway and described in the Street Railway Review for September 15, 1905, page 591, except that the width over all is 8 feet 8 inches for the Buffalo cars instead of 9 feet, and the height from rail to trolley board is 11 feet 7 inches instead of 12 feet 1 inch. The equipment is the same as for the Chicago cars except that the fender is different and drawbars are attached as shown in the accompanying illustration.



Cars for Buffalo—Drawbar Attachment.

MUNICIPAL OWNERSHIP IN GERMANY.

BY HUGO R. MEYER.

In all of the more important countries the practice of municipal ownership occurs not singly, but in conjunction with the alternative practice of severe restrictions upon the profits which the so-called public service companies shall be allowed to make. In all essential respects the experience of Germany under this two-fold practice has been a repetition of the experience of Great Britain. The practice of municipal ownership, coupled with the alternative practice of severe limitations upon the profits of the so-called public service companies, in Germany, as in Great Britain, has engendered a spirit of distrust of, and hostility to, public service companies, which ultimately has made the public more intent upon imposing restrictions upon the public service companies, than upon securing services that shall be sufficient in extent and reasonable in price. After the spirit in question had paralyzed private enterprise, the municipalities themselves failed to fill the void thus created. The result has been: First, a serious restriction of facilities and services offered the public; second, the exclusion of German industry from the field of establishing and developing certain industries, notably the electric street railway and the central electric station. In the latter respect, Germany has been reduced from the position of a pioneer country, to the position of a country that imported certain great industries "ready made" from the United States.

The establishment of the gas lighting industry in Germany was the work exclusively of private individuals, notably Messrs. Unruh, W. and Ph. O. Oechselhauser, L. A. Riedinger, W. Nolte and Th. Weigel.

Toward the establishment of the horse street railway, the municipalities contributed nothing whatever. In 1889, the last year of the horse street railway era in the United States, 62 German cities had horse street railways. Only four of those German street railways had been built by cities; two of them had been sold at a loss shortly after completion, and a third one had been leased to a company, for the protection of the city treasury.

In the field of electric street railway building one finds the same record of failure of the municipalities to do the work of the industrial pioneer. At the beginning of 1903, there were in Germany 1,875 route-miles of electric street railway. Thereof, only 309 route-miles had been built by cities.

In the field of electric lighting, municipal ownership shows the same record of failure. Even for some years after private enterprise finally took up the electric lighting of cities—as an industry imported "ready-made" from the United States—the German cities would not touch it, with some minor exceptions, such as the city of Metz.

There is but one exception to the record of municipal failure in the field of initiating and upbuilding new industries. That exception is public water supply. With few exceptions the waterworks of Germany have been built by the cities and towns. In that field the cities showed power to initiate, because the power to compel every householder to become a customer removed the possibility of financial loss.

The conditions upon which charters are granted to public service companies in Germany are left to the discretion of the cities. A common condition, in the case of street railways, is that the roadbed shall pass to the city, free of cost, after the expiration of, say, 40 or 50 years. Rather commonly is added a franchise tax, which consists of a fixed annual sum per mile of track, or of a certain percentage of either the gross or net receipts. The taxes or charges levied from the street railway companies for keeping in repair and cleaning the streets, invariably are out of proportion to the use which the companies make of the streets. Sometimes the electric railway companies are compelled to purchase their power from the municipal electric light plant. Frequently they are obliged to carry free of cost certain city employes. Occasionally one finds a city whose main purpose is to promote the building of street railways: but generally the cities aim to make money through the sale of franchises, rather than to secure to the public a street railway service that shall be efficient in quality, sufficient in extent, and reasonable in price.

The effect of the foregoing practices has been permanently to restrict street railway building, first in the era of horse railways, and subsequently in the era of city electric street railways. The era of electric suburban street railways and of interurban street railways scarcely has dawned in Germany. Had Germany, in proportion to its population living in cities of upward of 50,000 people, been as well supplied with horse street railways in the year 1890, as the United States had been thus supplied 10 years previously, that is, in 1880, it would have had, in 1890, no less than 1,430 route-miles of horse street railway in its 47 cities with a population of upward of 50,000 people. As a matter of fact, it had less than 850 route-miles of horse street railway, distributed among some 65 cities of all sizes. Had those German cities which in 1890 had upward of 50,000 inhabitants, been as well supplied with street railways, in 1890, as were the corresponding American cities, they would have had a total of 1,990 route-miles of street railway. The foregoing comparisons between the street railway facilities of Germany and the United States, leave out of account the fact that there were in the United States in cities of less than 50,000 people, 466 miles of street railway in 1880, and 2,578 miles in 1890.

In 1879, in the grounds of the Berlin Industrial Exposition, Messrs. Siemens & Halske, inventors and manufacturers of world-wide reputation, installed and operated the first electric railway in the world. Upon the strength of the mechanical success achieved, Messrs. Siemens & Halske in 1880 and the subsequent years repeatedly applied for permission to erect and operate electric elevated railways in Berlin. All of their requests were rejected by the public authorities. In 1882 Messrs. Siemens & Halske built an overhead-wire electric surface railway from Charlottenburg to the Spandauer Bock. The current was taken from the overhead wire by means of a small so-called contact-wagon, which ran along the wire. In 1883 and 1884, respectively, they built in Germany and in Ireland two electric surface railways, which remained in operation, as built, for upward of 10 years. For carrying the current, these railways made use of a rail attached to posts erected alongside the railway track. In 1889, Messrs. Siemens & Halske opened for traffic the Budapest underground electric railway. Ultimately they invented a stirrup or loop, which is in use today upon several electric street railways in Germany, in competition with the trolley wheel, an American invention. These facts justify the inference that Messrs. Siemens & Halske would have achieved the electric street railway, had they been properly encouraged by the German public authorities. But the public opposition to the overhead wire, coupled with the great difficulty of raising capital for venturesome enterprises under the burdensome and comparatively short-lived German franchises, defeated Messrs. Siemens & Halske's efforts to achieve the electric street railway. After the death of Mr. Werner von Siemens, the experiment of the electric street railway was abandoned completely in Germany. The work was taken up in the United States, and in 1890, the "trolley" electric street railway was introduced into Germany as an industry "ready-made" in the United States. For a number of years after 1890, the electric street railway in Germany, in almost all of its details, continued to be patterned after American models.

In the years 1891 to 1893, the electric street railway made little progress in Germany. The terms upon which franchises could be obtained were such that it was practically impossible to raise money for a venture of uncertain financial outcome. By the year 1893, however, the experience of the United States as to the financial results of trolley lines was sufficiently conclusive to persuade the leading German financiers to co-operate with the leading manufacturers of electrical machinery in the building of trolley lines on a moderate scale. From 1896 to 1900, construction was fairly rapid; but since 1901 it has been rather moderate. In the German street railway journals one occasionally finds the statement that at present there is little further scope for electric street railway building, since practically all of the cities with more than 40,000 inhabitants have been supplied with street railways. The attitude of mind that prompts leading German electric street railway men to make such statements, and to act upon them, shows how greatly the German spirit of adventure has been impaired by the practice of granting only onerous and short-lived franchises.

In October, 1904, there were in Germany 144 cities and districts that had street railways. In other words, there was a street railway in very nearly each one of the 71 cities that had 50,000, or more, inhabitants; a street railway in about 40 to 45 per cent of the cities having between 20,000 and 50,000 inhabitants; and occasionally there was to be found a street railway in a city of less than 20,000 inhabitants. In the United States, in the year 1902, every town and city of 15,000, and more, inhabitants had a street railway; 76 per cent of the places of 9,000 to 10,000 people had street railways; and 41 per cent of the places of 4,000 to 5,000 inhabitants had street railways. In other words, in the United States, in 1902, places of 4,000 to 5,000 people were about as well supplied with street railways, as were places of 20,000 to 50,000 people, in Germany, in 1904.

In 1902, in the United States, in not less than 95 per cent of the cities of the United States having 50,000, and more, inhabitants, the proportion borne by the street railway track-mileage to the population, ranged from one mile of track for each 700 people, to one mile for each 1,800 people. In Germany, on the other hand, in 1903-04, in not less than 84 per cent of the cities of 50,000, and more, inhabitants, the proportion in question was one mile of track for each 4,000 to 13,000 people.* In other words, judged by American standards, the Germans scarcely have begun to use the street railway for the purpose of decentralizing, or "suburbanizing," the people of the larger cities. This matter is the more serious, since, in the German cities of 200,000, and more, inhabitants, the average density of population most commonly ranges from 20 persons per acre to 40 persons; whereas, in the corresponding American cities, the average density of population most commonly ranges from 12 persons per acre, to 22 persons. Berlin, with its immediate suburbs, has an aggregate population of 2,600,000 people. The average density of population is 75 persons per acre;

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*Twelfth Census of the United States, 1900, Vol. 1; Census Bulletin, No. 7, 1904. Census Bulletin, No. 3, 1903; Elektrotechnische Zeitschrift, July 13, 1905; Eisenbahntechnische Zeitschrift, May 17, 1905; Statistisches Jahrbuch deutscher Staedte, 1902; and Illustrirte Zeitschrift fuer Klein-und Strassenbahnen, Jan. 16, 1903.

Cities of 50,000, and more, inhabitants.

Less than 1,000 people	5	0
Each 1,000 to 1,999 people	46	2
" 2,000 " 2,999 "	10	2
" 3,000 " 3,999 "	2	5
" 4,000 " 4,999 "	0	14
" 5,000 " 5,999 "	1	10
" 6,000 " 6,999 "	0	6
" 7,000 " 7,999 "	0	8
" 8,000 " 8,999 "	0	2
" 9,000 " 9,999 "	0	2
" 10,000 " 10,999 "	0	4
" 11,000 " 11,999 "	0	1
" 13,000 " "	0	1
Total number of cities	14	57

the street railway track mileage is one mile of track for each 5,600 people. Greater New York has an average density of population of 18 persons per acre; and one mile of surface street railway track for each 3,500 people.

The city residents of Germany labor not only under the disadvantage of restricted street railway facilities, but also, in most instances, under the further disadvantage of the system of fares graded according to distance. That system very generally, if not all but universally, raises above 2.5 cents the fare for a ride exceeding 2.5 miles.* On the other hand, experience has shown that any sum above 2.5 cents is so far beyond the spending power of the bulk of the population as to make impossible the rapid decentralization of the population on the basis of fares exceeding 2.5 cents. It is barely possible that the public could afford to pay 3 cents; but that fare is not practicable, for the reason that there is no 3-cent coin, and the public is unwilling to carry coppers. The alternative to a uniform fare of 2.5 cents is one of 3.75 cents, a sum beyond the spending power of the bulk of the population.

A few years ago, when the then horse street railway companies were applying for extensions of charters which should permit them to convert to electric traction, it would have been possible to drive bargains under which the companies would have bound themselves to build into the suburbs, and adopt the uniform fare of 2.5 cents. But the cities misjudged the situation, underestimating the difficulties incidental to the upbuilding of street railway systems of the American type. Very few companies, if any, succeeded in obtaining the terms which they demanded. On the other hand, a small number of cities bought out the companies, and then either themselves managed, or leased, the street railways, after having equipped them for electric traction. The cities imposed upon the lessees, or themselves adopted, the uniform fare of 2.5 cents. But with the exception of Nuernberg and Darmstadt, all of the cities abandoned the uniform 2.5-cent fare after a short trial. They were unwilling to suffer the financial loss which would have to be incurred until the people should have moved into the suburbs in sufficient numbers to make profitable the uniform 2.5-cent fare. Among the cities in which the uniform fare was abandoned, were Munich, Cologne, Frankfort o. M., Elberfeld-Barmen, Duesseldorf, Mannheim, Muehlheim o. R., and Koenigsberg. Only two of the cities, Duesseldorf and Muehlheim, had street railway facilities that by any stretch of language could be said to approach the American standard.† The unwillingness of the cities to suffer financial losses on behalf of the congested city populations, after those cities had denied those congested populations relief at the hands of profit-seeking companies, is in instructive contrast to the eloquence with which the advocates of purchase by the cities had denounced the dividend-seeking companies.

ROTARY CONVERTER SUBSTATION FOR SYRACUSE RAPID TRANSIT RAILWAY.

A year or more ago the management of the Syracuse Rapid Transit Railway Company was called upon to meet a demand for more power. The condition was met by contracting with the Niagara Lockport & Ontario Power Company, of Buffalo, for the delivery at Syracuse of 3-phase high-tension current generated at the Niagara Falls plant of the Ontario Power Company, of Niagara Falls. The railway company as its initial high-tension installation has erected adjacent to its old direct-current generating station located on the Erie canal at Van Rensselaer street in Syracuse, a substation designed for the transformation and distribution of 5,000 horsepower. This substation, which was practically completed July 1, was designed by Mr. E. J. Cook, chief engineer of the Cleveland Electric Railway Company, which company, as is well known, is closely allied with the Syracuse railway. Mr. Horace E. Andrews is president and Mr. John J. Stanley vice-president and manager of both companies.

The Syracuse substation presents a number of novel and interesting features in general design and detailed arrangement which will be apparent upon inspection of the drawings shown herewith; for these drawings and data we are indebted to Mr. J. E. Duffy, superintendent of the Syracuse Rapid Transit Railway Company.

Syracuse Rapid Transit Substation—West End of Substation Showing Dead-End Tower of Transmission Line.

The building, which is of red brick trimmed with gray Onondaga limestone, covers a ground area of 73 feet 10 inches by 59 feet 4 inches, and is divided into three rooms. One of these is for the rotary converters and switchboards and is 34 feet wide, extending the length of the building; the other two rooms are each 22 feet wide by 34 feet long, one containing the transformers, and the other the high tension oil switches, hook switches, lightning arresters, etc. The south portion of the building (the rotary converter room) has the roof carried on steel trusses; in the other section, the span being shorter, the roof is supported on 9-inch I-beams fireproofed with concrete. To hold the concrete in place the beams are wrapped with No. 10 galvanized wire, the coils being 10 inches apart. The roof covering of both portions of the building is of concrete slabs, made of 1 part cement, 2½ parts sand and 5 parts cinders; the slabs are about 4 feet square and are reinforced with expanded metal of No. 10 gauge with 3-inch mesh and 5-32-inch strands. At the east end each section of the building has a wide doorway

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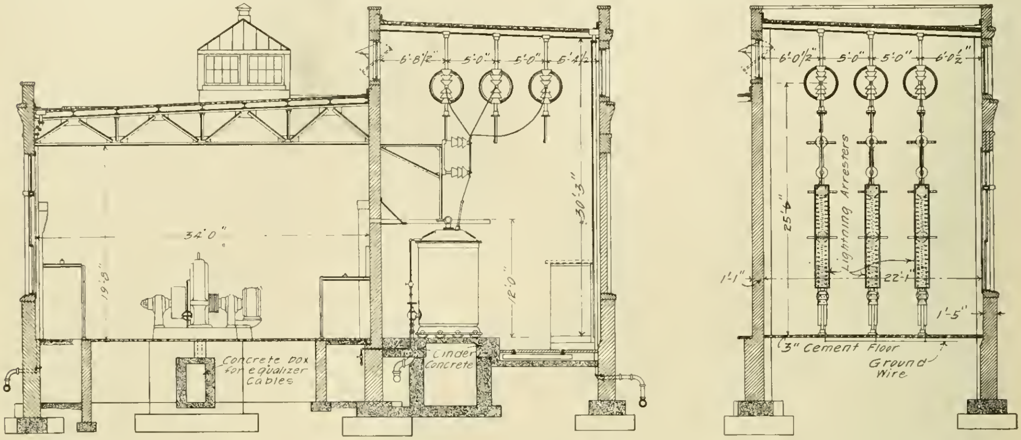
*The following schemes of charges are typical. Cologne: 2.5 cents for any distance up to 1.9 miles; 3.75 cents for 3.75 miles; 5 cents for 5.63 miles; and 6.25 cents for distances over 5.63 miles. Duesseldorf: 2.5 cents for 1.56 miles; 3.75 cents for 3.19 miles; 5 cents for 4 miles; 6.25 cents for 4.75 miles; 7.5 cents for 6.38 miles; 8.75 cents for 7.19 miles; and 10 cents for 7.94 miles; provided, that the charge from any point within the city to any point without the city, shall not exceed 3.75 cents.

†In Germany it will take longer to teach the people to move into the suburbs, than it took in the United States, for the reason that in the United States the horse street railway had begun the work of teaching the people to live in the suburbs. In Germany the horse railway never developed beyond the point of being a means of communication between points within the city proper.

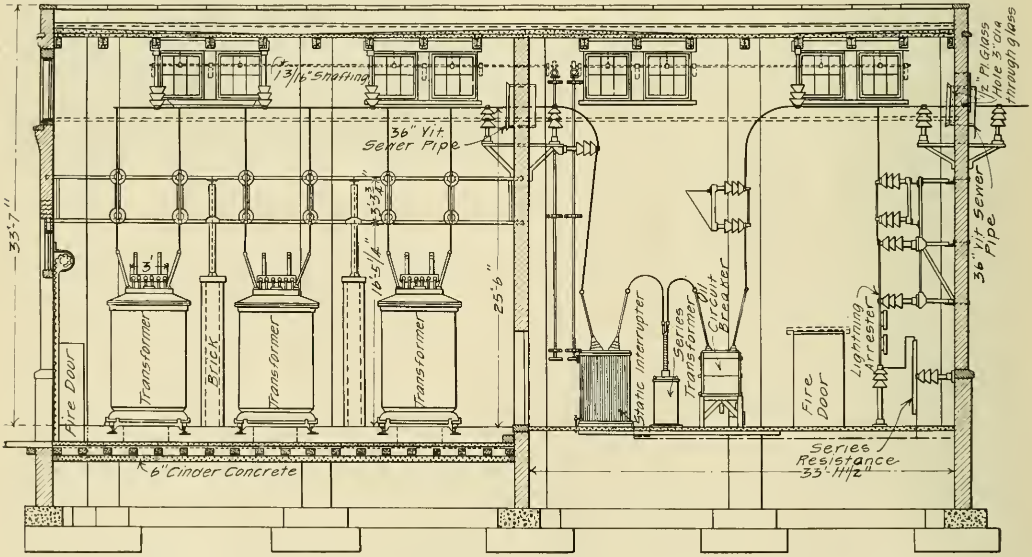
	Population Served.	Miles of Track.	One Mile of track for each.
Munich	550,000	93	5,900 people
Cologne	450,000	96	4,600 "
Frankfort-on-Main	390,000	60	6,500 "
Elberfeld-Barmen	330,000	83	4,000 "
Duesseldorf	270,000	128	2,100 "
Mannheim	146,000	27	5,400 "
Muehlheim-on-Rhine	40,000	14	2,800 "

closed by Kinnear rolling steel doors. The building was erected and the machinery installed under the supervision of Mr. A. E. Steirly, chief engineer of power plants.



Syracuse Rapid Transit Substation—Cross-Section Through Transformer, Rotary Converter and Lightning Arrester Rooms.

The general arrangement of the building and of the electrical equipment in it is given in the plan, while the cross-sectional views show in greater detail a number of interesting features in connection with the high-tension lines and switching gear. The dead-end tower of the transmission line is located just outside of the substation at its west end. In the west wall of the high-tension room are set three 36-inch vitrified sewer tiles, sloping 1½ inches to the foot; in the bell ends of the tiles, which are inside the house, are cemented single pieces of ½-inch plate glass with 3-inch holes in the centre for the conductors. Similar tiles are set in the wall dividing the high-tension room from the transformer room.

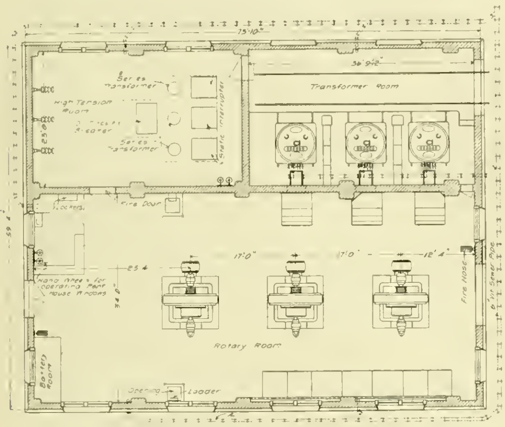


Syracuse Rapid Transit Substation—Longitudinal Section Through High-Tension and Transformer Rooms.

Inside of the substation, and also for making connections to the line cables on the dead-end tower, the high-tension conductors are of brass tubing of ⅜-inch inside diameter with the joints made with standard brass pipe fittings. Whenever practicable in the high-tension and the transformer rooms the high-tension conductors are carried upon standard line insulators. (R. Thomas & Son 60,000-volt triple-petticoat porcelain insulators with 15-inch maximum diameter, similar to those used on the transmission line built by the railway company in Syracuse.) In the substation these insulators are supported on brackets made of angles, or on pipes, fixed to the walls, floor or ceiling as indicated in the two cross-sectional views from which the arrangement of conductors, lightning arresters, switches, etc., is readily seen.

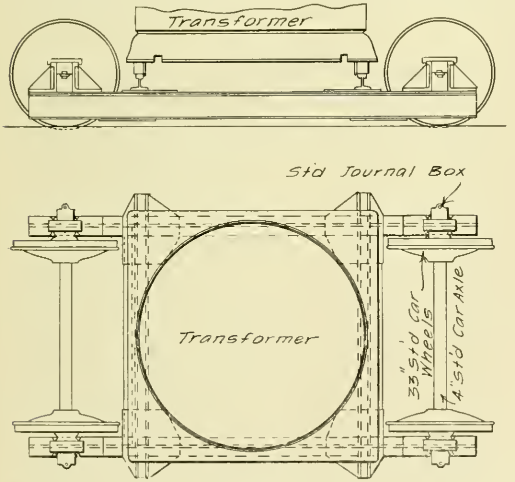
The low-tension cables from the transformer room and those connecting the rotaries with the switchboards are all carried underneath the floor of the rotary converter room and the basement under this portion of the building has plenty of headroom so that work on the cables can be done conveniently.

In the transformer room there are a track and transfer table for convenience in moving the transformers when occasion arises. The details of this car are shown in one of the illustrations. No crane for handling machinery in the rotary converter room has been installed, but the design provided inside pilasters on the longitudinal walls upon which track beams for a traveling crane may be mounted when desired.



Syracuse Rapid Transit Substation—Plan of Substation Building.

The electrical equipment for this station was all furnished by the Westinghouse Electric & Manufacturing Company and comprises: three 1,000-kilowatt rotary converters designed for transforming six-phase alternating current at 433 volts and 3,000 alternations to direct current at 600 volts; each of these machines is fitted with a type C induction motor for starting, mounted on the same base plate, and also with an oscillator; three oil-insulated water-cooled 1,000-kilowatt transformers which may be operated singly or as one group of three connected in delta to change 55,000-volt three-phase current to 433-volt six-phase; each low-tension winding consists of three separate coils for supplying current to the three rotary converters when the transformers are connected on the 3-phase circuits; switchboards including one alternating-current load board of three panels, three alternating-current-direct-current rotary converter boards of three panels each, and one direct-current load board of three panels.



Syracuse Rapid Transit Substation—Transfer Table for Transformer Room.

In the high tension equipment there are three 60,000-volt Westinghouse low equivalent lightning arresters, twelve 50-ampere, 60,000-volt single-throw hook switches, one 50-ampere, 60,000-volt, 3-pole automatic oil switch with time limit relay, and three 1,000-kilowatt static interrupters. A 50-cell storage battery of 40 ampere-hours capacity for auxiliary purposes is located in the southwest corner of the rotary converter room, and opposite this in the northwest corner of the room are Merritt lockers for the use of the substation employes.

ELECTRIC RAILWAY TEST COMMISSION

BY HENRY H. NORRIS, M. E., AND BERNARD V. SWENSON, E. E., M. E.

The report of the Electric Railway Test Commission, which has been published recently, places before the electric railway fraternity the results of two years of investigation of the laws of electric railway operation. For the purpose of analyzing the work it may be arranged in three divisions: Organization, Investigation and Deduction.

While the details of the organization of the plan are familiar to many of the readers, a few words of review will serve to connect the preparation with the final result. The commission was appointed in November, 1903, by President David R. Francis of the Louisiana Purchase Exposition, in conference with Prof. W. E. Goldsborough, chief of the Department of Electricity at the exposition. These gentlemen believed that an exceptional opportunity for investigation was presented by the assembly of exhibits at St. Louis and that, in order to make the most of this opportunity, the work should be conducted by a commission composed of individuals of wide experience in the construction, operation and management of electric railroads.

The commission consisted of the following: J. G. White, chairman; James H. McGraw, secretary; H. H. Vreeland, treasurer; W. J. Wilgus and George F. McCulloch.

It was realized that there were many railway problems still unsolved and the willingness of the individual members of the commission to serve in this capacity indicated that they believed that the time was opportune for the solution of some of these problems. However, it was necessary first to determine what lines of investigation really needed attention, and then to decide upon which should be attempted under existing circumstances. Finally the financial means for accomplishing the desired results had be to decided upon. Obviously, the suggested tests would require funds and investigators would be needed to carry out the tests.

The first step taken by the commission was the appointment of four engineering committees, as follows: "Test of City and Suburban Equipments," "Test of Interurban Equipments," "Test of Heavy Traction Equipments" and "Test of New Electric Railway Systems." These committees were composed of leading experts in the design, construction and operation of electric railway apparatus, and in the practical operation and management of electric railway systems. Their reports containing suggestions as to those tests which could be most profitably carried out, were very complete and formed the basis of the investigations which were subsequently carried on by the commission.

An executive committee was next appointed for the purpose of carrying out the proposed investigations. This committee was composed of individuals selected from the instruction corps of well known technical schools; such a committee being presumably unbiased with respect to the product of any particular manufacturing concern. Associated with the executive committee was an advisory committee composed of representatives of the manufacturing and constructing side of the business.

The commission appealed to the railway interests at large for funds to carry on the work. This appeal was responded to liberally, with the result that approximately $10,000 were subscribed by 83 individuals and companies, in amounts ranging from $25 to $700. In addition to these cash contributions, various manufacturers volunteered to supply apparatus and equipment and the Louisiana Purchase Exposition constructed two special test tracks on the World's Fair grounds for the use of the commission. Various colleges aided in the work materially, by the loan of numerous measuring instruments, and the United States Bureau of Standards rendered most valuable assistance in the calibration of these instruments.

Choice of Tests.

The tests as actually carried out comprised as many of the suggested investigations as it was practicable to perform. The executive committee was under the necessity of making all preparations and tests within a limited time and, as a consequence, it was essential that these tests be carried out expeditiously. When it is considered that such investigations as were made by the commission ordinarily extend over a period of years and involve the expenditure of large sums of money, the exacting conditions of this work will be realized. By utilizing every opportunity for securing equipment and obtaining facilities for testing, it was possible to make a considerable variety of tests. The number of separate and distinct tests actually carried out was 61, and many of these involved a large number of individual tests.

From the first it was evident that the greatest interest at the present time centers in the subjects of train and air resistance. While a number of excellent formulas are in use, they give widely varying results due to the differing conditions under which the underlying experiments were performed. The commission was urged to undertake investigations which might assist in producing a rational train resistance formula, and from the first this goal was kept in view. The train and air resistance investigations, including the preparation of the plans, the performance of the experiments and the working up of the data, therefore covered a period of nearly two years. Before discussing any of the investigations in detail, it may be well to study the general scope of all of the tests and to indicate the relation of one part to another.

The major portion of the work was devoted to problems connected with the movement of rolling stock. Naturally, this involved studies of acceleration and braking, together with tests of cars under service conditions. Paralleling these tests, an investigation was carried on concerning the comparative losses in rails carrying alternating and direct currents. These tests, which consumed almost as much time as that devoted to the train and air resistance investigations, were productive of much valuable information.

Acceleration Tests.

Under certain conditions it is very important to know just what may reasonably be expected in the way of bringing cars up to speed, and for this reason an extensive series of acceleration tests was conducted on both single-truck and double-truck cars. While the problem of acceleration is small from the standpoint of economy so far as the car is concerned, it is a different matter entirely when viewed from the standpoint of power supply. If an attempt is made to accelerate a car too rapidly, the excessive current drawn from the line will cause a large line drop and an undue strain on the motors, with a reduction of efficiency and some considerable discomfort to the passengers. If the ratio of the kinetic energy existing in the car at the end of acceleration to the energy input be called the acceleration efficiency, this quantity will be a maximum under certain conditions which can be determined experimentally. Careful attention was therefore given to this subject and data were obtained showing the relation of the rate of acceleration to all of the other variables entering into the problem. With a light city car it was found practicable to use an average acceleration of 1.33 miles per hour per second with a maximum acceleration of 2.5 miles per hour per second. This rapid acceleration, however, entailed a considerable strain on the equipment. A maximum speed of 20 miles per hour in this case was attained in 287 feet, the elapsed time from the start being 14.5 seconds. Similar tests made with a heavy interurban car resulted in an average acceleration of 0.59 miles per hour per second, a speed of 38 miles per hour being reached in 2540 feet, the elapsed time from the start being 62.5 seconds. The rate of acceleration in this case was dependent upon the automatic control system. The maximum acceleration for the interurban car was 1.55 miles per hour per second.

Braking Tests.

It is probable that the braking tests made by the commission will be of service in determining the distance and time required to stop a car from various speeds. This is a matter which affects the safety of the public to a considerable extent. The braking tests covered a wide range of conditions. The average results show that a light city car weighing 14 tons and running at a speed of 18 miles per hour, can be stopped in a distance of 115 feet with an average deceleration of over 2.5 miles per hour per second, the time consumed in bringing the car to rest being slightly more than 7 seconds. A heavy interurban car weighing 40 tons can be brought to rest from a speed of 55 miles an hour, at an average deceleration of 2.4 miles per hour per second, during a period of approximately 23 seconds and while covering a distance somewhat under 1,000 feet. This was accomplished with 40 pounds pressure in the air brake cylinder and the performance could be somewhat improved with a higher braking pressure, although this is probably as great an average deceleration as should be employed.

In connection with the general subject of braking, a study was made of the air consumption of cars for the purpose of determining the amount of energy necessary to compress air for braking purposes, both in the storage air system and in the ordinary motor-compressor system of air braking. It was found that so far as energy is concerned, it is more economical to place the air compressors on the cars. On the other hand, the tests show that the proportion of the total energy used in braking is so small that efficiency is really a secondary consideration. Between one and two per cent of the total energy will serve to stop the car, even under conditions where stops are frequent and where the air is used very freely. The data obtained from these tests will probably be found useful also in studying the cost of compressing air for other purposes than car braking, as compressed air is being more and more used for miscellaneous purposes about a railway plant.

Service Results.

While electric railway literature probably contains more data relating to service tests of cars than to acceleration, braking, train resistance and air resistance, the commission considered it desirable to add to the existing information such results as could be obtained from the cars upon which the other investigations were being made. Very comprehensive service tests were therefore performed upon the three classes of cars under study;' namely, single-truck and double-truck city cars and interurban cars, the latter with and without trailer. In these tests graphical means of recording the data were used as far as practicable.

The single-truck city car was tested on the tracks on the World's Fair grounds under a schedule designed to duplicate as near as possible the ordinary conditions of service corresponding to a schedule speed of 10 miles per hour with 6.7 stops per mile, the corresponding maximum speed being somewhat over 20 miles per hour. The energy consumed per car mile in this case was 2.3 kilowatt-hours, corresponding to 160 watt-hours per ton mile, the weight of the car being 14 tons. These service tests were made with both hand and magnetic brakes and no appreciable difference was noted between the two from the standpoint of energy consumption. A double-truck city car weighing 22.5 tons was tested in regular service on the Park Avenue line of the St. Louis Transit Company, now the United Railway Company of St. Louis. It was found that this service comprised an average schedule speed of 9.3 miles per hour with 4.5 stops per mile. The energy consumption here was 2.74 kilowatt-hours per car mile, or 122 watt-hours per ton mile, both these quantities being very uniform throughout the series of tests which covered both wet and dry track. The service tests on interurban cars were made on the lines of the Indiana Union Traction Company between Indianapolis and Muncie with a modern heavy car and trailer, the former weighing 40 tons and the latter weighing 22.5 tons. The average speed was slightly under 30 miles an hour, being greater between cities and less in cities. The energy consumption for the motor car alone was 3.3 kilowatt-hours per car mile or 84 watt-hours per ton mile while with the trailer the kilowatt-hours per train mile were 4.6 and the watt-hours per ton mile were 73.8. These various service tests give data for comparing the energy consumption in the various classes of service, and from these data, the energy consumption under different conditions may be calculated.

Air Resistance Tests.

The resistance tests made by the commission may be divided into two general sections; first, those covering the total train resistance; and second, those which related to the air resistance of car bodies and vestibules. The total resistance was determined for various speeds, with the car operated both backward and forward. Two cars were used in these tests, one being the interurban car employed in the service tests and the other a special dynamometer car known as the "Louisiana," which was described in the Street Railway Review for March, 1905, page 139. The latter car was equipped with vestibules of various forms, and a series of resistance runs was made with different vestibules in position in order that the effect of the shape of the vestibule on the total car resistance could be readily determined. The results of these resistance tests show values varying from a minimum of 12 pounds per ton at 20 miles per hour with the best combination of vestibules to 43 pounds per ton at 60 miles per hour with a poor form of vestibule. These tests give reference data for standard interurban cars and the tests were made under such a variety of conditions that they may be considered to represent average values.

While the train resistance tests were not as complete as the commission could have wished, the air resistance tests were carried out in great detail. For the purpose of separating the air resistance from the other elements of the total resistance, the special dynamometer car "Louisiana" was constructed. The general principle followed in the construction of this car was to support one vestibule in such a way that the pressure upon it could be measured by means of a dynamometer. Similarly the entire car body, including the vestibules, was carried upon bearings as nearly frictionless as possible and the air resistance overcome by this body was measured upon a second dynamometer. This special dynamometer car was propelled at various speeds up to 75 miles per hour by means of a four-motor equipment having a total capacity of 300 nominal horsepower. Several hundred runs were made with various vestibules and the pressures were actually weighed with a reasonable regree of accuracy. The results of these tests are very surprising especially from the standpoint of the effect of the shape of the vestibule. With the motor capacity installed, it was impossible to propel the car at a speed of 60 miles per hour with the flat front, while 70 miles per hour was easily reached with a parabolic wedge front. The power absorbed by the various forms of vestibule was carefully determined and, by means of the general form of the curves, these calculations were carried out to 100 miles per hour. At the latter speed, the curves show that 467 kilowatts would be required to propel a flat-ended car against air resistance alone, while 175 kilowatts would produce a speed of 100 miles per hour in a car equipped with vestibules of parabola or parabolic wedge form. Even when equipped with the ordinary standard vestibule, if any vestibule may be called standard, the car consumes 346 kilowatts at 100 miles per hour. In connection with every test made upon the effect of air pressure, the corresponding suction was determined and, while the suction was not found to be very great, it has an appreciable value. The pressure per square foot on the front of the vestibule varied from 0.4 of a pound at 20 miles per hour with the parabolic wedge vestibule, to 8.2 pounds at 60 miles per hour with the flat form of vestibule. The suction per square foot on the rear vestibule varied from 0.1 of a pound at 20 miles per hour with the parabola vestibule, to 1.0 pound at 60 miles per hour with the standard vestibule.

The effect of the air resistance on the surface of the car body was found to be small compared with the head pressure, the tests indicating that at very high speeds the head pressure and rear suction comprise the major portion of the air resistance. An average value of the body resistance was obtained, however, and was found to be 97.6 pounds at an average speed of 36.4 miles per hour. It is safe to use this value for the car body resistance above and below the speed mentioned as the error therein is not important.

As a result of these tests the suggestion is made that high speed interurban cars should be constructed with a rather sharp front vestibule and a parabola-shaped rear vestibule, in order that the air resistance may be minimized. No advantage appears to result from making the front perfectly sharp, which would be objectionable in any event as it would place the framework of the windows in the motorman's line of vision.

Rail and Track Resistances.

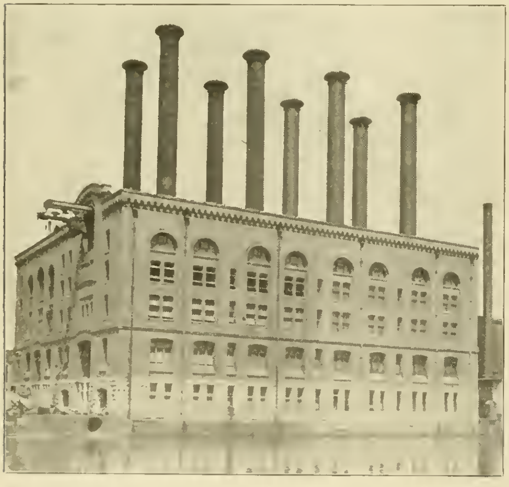
Mention has been made of the tests on alternating current rail and track losses. This matter is one of considerable importance in view of the growing tendency to introduce alternating current systems in which the rail is used as a conductor. A number of different sections of rails and bars were tested at different frequencies and at different current densities. The power factor, the rail drop, the temperatnre and the ratio of the alternating current impedance to the direct current resistance were carefully determined. It was found that the alternating current losses are of such a magnitude under certain conditions that they must be given considerable attention. The tests upon single rails were checked by a series of investigations made upon the test track at the exposition grounds, the latter tests being made with various combinations of track and trolley so that the effect of any one element could be eliminated. The results of the track tests corroborate the deductions drawn from the single rail tests.

This summarizes in a general way the work of the Electric Railway Test Commission. It is felt that the results accomplished are but a beginning, as many railway problems still remain to be solved. The investigations were made possible only through the active support of the individuals and companies interested. The test car "Louisiana" has been transferred from the Electric Railway Test Commission to the American Street & Interurban Railway Association and it is probable that the association will continue the investigations already begun and that it may undertake others of equal importance.

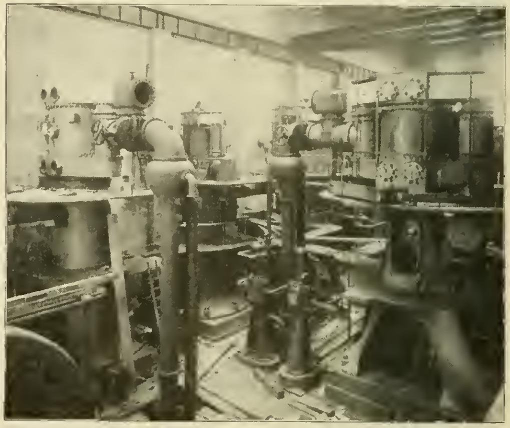
THE COMMERCE STREET POWER PLANT OF THE MILWAUKEE ELECTRIC RAILWAY & LIGHT COMPANY.

The Milwaukee Electric Railway & Light Company recently has more than doubled the capacity of its Commerce street power plant. In order to accommodate additional equipment, the original building was extended to the north. The plant now furnishes current for three classes of service: 25-cycle, 13,200-volt alternating current; 60-cycle, 2,300-4,000-volt alternating current, and 600-volt direct current. The generating units consist of vertical cross-compound, Corliss-valve engines direct connected to alternating or direct-current generators, and vertical turbine generating units. The auxiliaries for the engines generating current for these classes of service are electrically driven by motors supplied with current from the busbars with which their generating unit is connected. The unit system has been maintained throughout the construction of the power plant from the stacks to the distribution feeders.

There are eight stacks serving eight sets of boilers positively subdivided into two groups and with no cross connections. Each of these eight sets of boilers feeds steam direct to an engine driving a generating unit. As the turbines were installed after most of the station had been erected, separate boilers are not provided for their steam supply, but each turbine is fed by a steam main which has its source of supply in the equalizing header connecting the two groups of boilers. The engines driving the four direct-current generators are fed by one-half of the 16 boilers and the engines driving the alternating-current generators are fed by the other half of the boiler equipment. As there is no cross connection between the two halves of the station equipment, except through the atmospheric exhaust and the boiler feed line, the probability of a complete shut down of the plant is very remote. While there are but four boiler feed pumps for all the boilers, any two of these pumps have sufficient capacity to feed the entire battery of boilers, and as a reserve each boiler has an injector which may be called into use. The injectors take their suction from a supply independent of the boiler feed.



Commerce Street Power Plant, Milwaukee—View from River.



Commerce Street Power Plant, Milwaukee—Reciprocating Engines with Barometric Condensers.

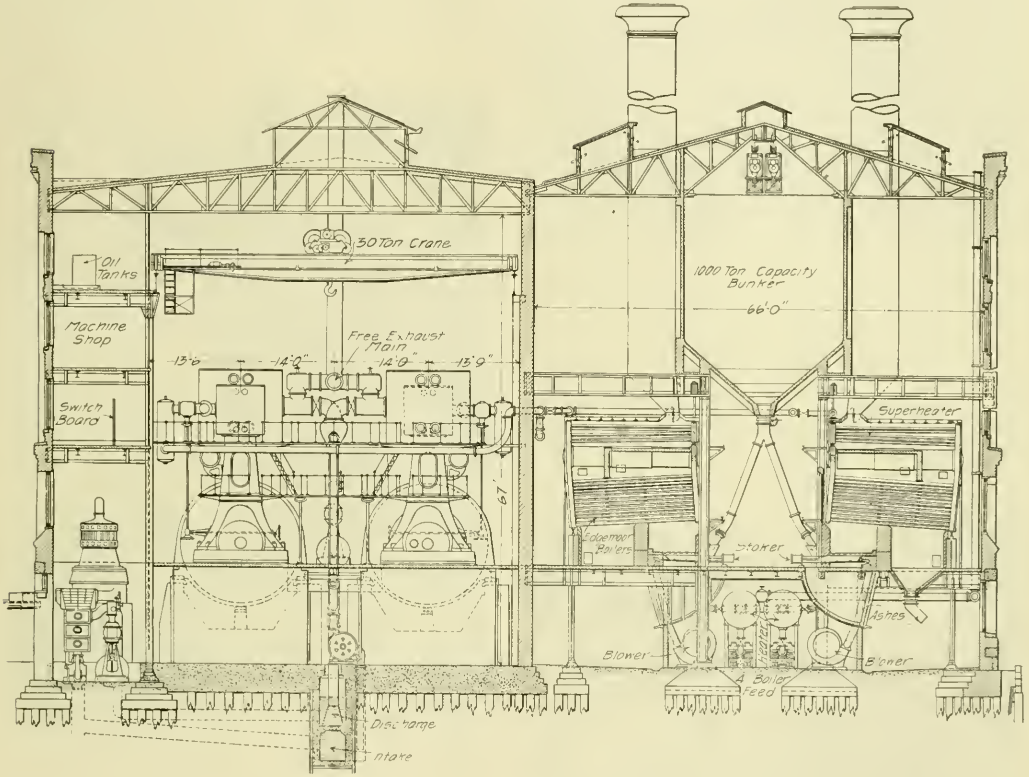
Building Construction.

The power station building is a brick structure rectangular in section and subdivided into two main rooms by a firewall. The engine room is 157 feet long by 70 feet wide. The boiler room is 157 feet long by 66 feet wide. A portion of the engine-room space throughout the length of the building and 14 feet wide is subdivided by steel-concrete floors into a ground space for the turbine equipment and three elevated galleries. The first balcony above the engine-room floor supports the switchboard apparatus and is on a level with the engine galleries built around the lower ends of the cylinder casings. The compact arrangement of the engines and the generous width of the runway about the cylinders, with cross connections between the galleries of the various engines, make all the cylinder valves and heads readily accessible from the switchboard gallery. Above the switchboard space is a machine shop where there has been placed an ample equipment of tools suitable for constructing many of the small machines used by the railway company and for repairing all power plant machinery. The equipment in this shop includes two lathes, two drill presses and one each of the following tools: Shaper, drill grinder, dry and wet grinder, Gorton surface grinder, electric-driven buffer and power hacksaw. Each of these tools is direct-connected to a small electric motor. On the machine-shop gallery are the quarters of the engineer in charge of the power plant. A portion of the upper gallery is occupied by the filter of the oiling system. A Pawling & Harnischfeger crane of 30-tons capacity spans the engine-room space.

Boiler Equipment.

The boiler equipment consists of eight units, each having 6,493 feet of heating surface and 2,313 square feet of superheating surface, and eight units with 7,775 square feet of heating surface and 2,511 square feet of superheating surface. The boilers are set in pairs and arranged in rows on either side of a central aisle extending the length of the boiler house. Forced draft for each boiler is furnished by a 50-inch blower fan driven by a 20-horsepower motor. The fan motors for one-half of the boilers are operated by alternating current and those for the other half by direct current, so arranged that the boilers which furnish steam for driving the alternating current generators have their forced-draft fans operated by alternating current and a similar arrangement is observed for the direct-current half of the station.

The superheaters installed as a part of each boiler consist of five rows of 4-inch tubes which afford one-third as much heating surface above the drums as do the boiler tubes below. Before exhausting to the atmosphere the gases make their last pass through the superheating tubes so that all heat taken up by the superheaters is gained. Under ordinary conditions the superheaters raise the temperature of the steam about 65 degrees above the temperature of saturation at the pressure under which the boilers are operated.



Commerce Street Power Plant, Milwaukee—Vertical Section of Building.

The structure has been designed for economizers, but with the present arrangement of apparatus and prices of fuel it is not thought that the investment in this station would be warranted.

After passing through the boiler and superheating setting the furnace gases of each boiler exhaust to a 100-foot steel stack. These stacks are 8 feet in clear diameter and are unlined, the first ring being of ⅜-inch and the remaining portion of ¼-inch sheet steel. The stacks are stayed by the roof trusses and a special grill at a point 30 feet above their bases so that no guys are needed at the tops of the stacks. The air pressure on each boiler is automatically controlled by a Spencer regulator.

At the present time coal is brought to this station in specially designed wagons, the boxes of which can be raised by an elevator and carried inside the station and dumped into the general storage bunker. The coal storage bunker extends throughout the length of the building and over the aisle space between the two rows of boilers. This bunker is of reinforced concrete construction and has capacity for holding 1,000 tons of coal. From the hopper below the bunker coal is led by gravity chutes to the hoppers of a Jones underfeed stoker. Below the firebox and behind the middle wall of each boiler are hoppers, so placed that ashes from the grates will fall by gravity to a point where they can be discharged into wagons. The detail arrangements of the boiler equipment may be noted in the vertical section of the power plant building.

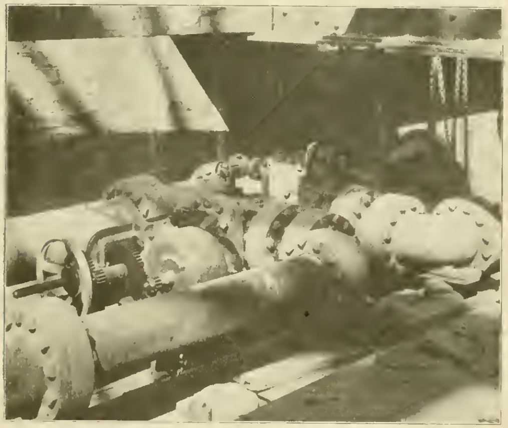
Engine Equipment.

The reciprocating engine equipment consists of four 28 and 60 x 48-inch vertical cross-compound Allis-Chalmers engines, each having on its shaft the revolving field of a 1,500-kilowatt, 25-cycle, 3-phase, 13,200-volt General Electric alternator, also four 32 and 68 x 48-inch similar engines driving 2,000-kilowatt, 600-volt, General Electric railway generators. These eight units operate at 94 revolutions per minute and all electrical apparatus is designed for its rated temperature rise to have a room temperature of 40 degrees centigrade rather than 25 degrees as is more common practice. The foundations for the several units are of solid concrete tied together below the base of the floor with steel reinforcements and tied together at the top by reinforced ties 4 feet square in section and by the reinforced concrete engine-room floor. These 4-foot ties are used as supports for the vacuum pumps of the condenser equipment.

Excitation current for each of the four reciprocating, engine-driven units is furnished by a Curtis non-condensing horizontal turbine driving an exciter at 3,600 revolutions per minute and generating direct current at 120 volts pressure.

Commerce Street Power Plant, Milwaukee—Coal Wagon.

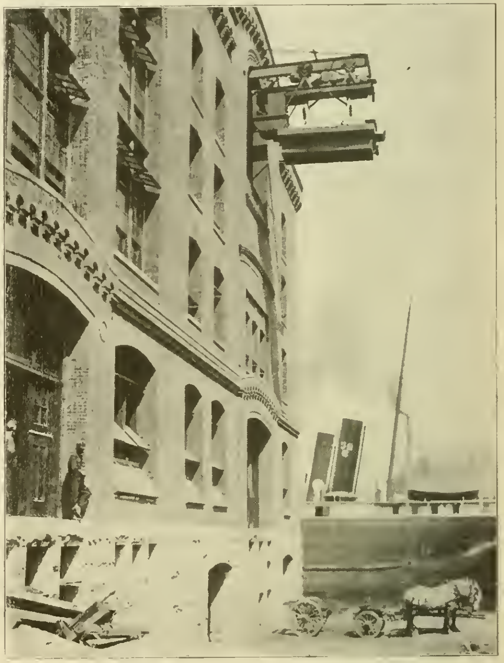
In addition to the engine and turbine-driven units there are three 500-kilowatt capacity motor-generator sets with 13,200-volt, 25-cycle, synchronous motors driving 2,300-volt, 60-cycle alternating-current generators. These phase-changing sets increase the flexibility of the station by offering a means for adjusting the load between the 60-cycle reciprocating-engine-driven alternators and the 25-cycle turbine-driven alternators. There is also one motor-driven exciter for the turbine sets consisting of a 150-kilowatt, 25-cycle induction motor driving a 120-volt, direct-current generator.



Commerce Street Power Plant, Milwaukee—Motor-Operated High Pressure Valves.

Auxiliaries and Piping.

An accompanying illustration shows, in plan and elevation, the high-pressure steam piping for half of the power station. It will be noted that there are two boiler connections from each one of the two boilers which are contained in one setting. The piping is so arranged that steam from each pair of boilers is led in a direct way to one of the reciprocating units. By means of an equalizing header 10 inches in diameter and motor-operated valves in each section of the pipe, any particular engine can be supplied with steam from any desired pair of boilers. Steam for operating one of the turbine units is taken from the header as shown on the drawing. This steam main to the turbine passes under the engine-room floor and across the width of the building to the turbine plant under the switchboard gallery. The piping in the half of the station not shown is similar to that which has been described and another steam main for the turbine is installed in the other half of the station. Should one section of the plant be inoperative, steam will yet be available for the operation of one of the turbine units. All the high-pressure steam piping to the reciprocating engines is 10 inches in diameter. The mains for the turbine steam supply are 7 inches in diameter. All valves in the high-pressure mains are motor-operated with remote control switches in the switchboard gallery.

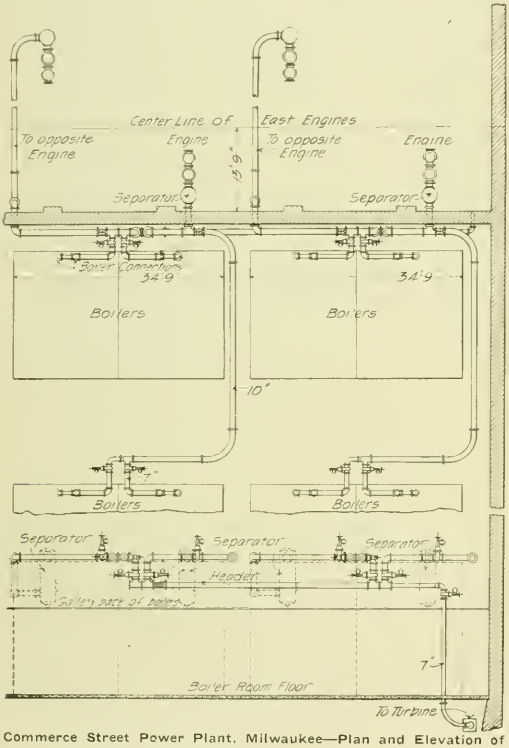


Commerce Street Power Plant, Milwaukee—Hoist, with Wagon Box Ready to Enter Coal Bunker.

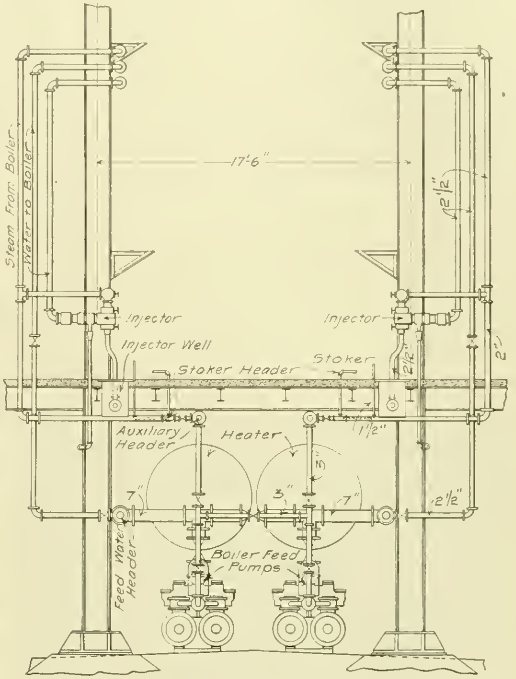
It will be noted on the vertical section of the engine room that a free exhaust main extends throughout the length of the building and at the elevation of the cylinder heads. The low-pressure cylinder on each engine connects with this free-exhaust main through a back-pressure valve on top of a T. The horizontal end of the T through which, under ordinary conditions, the exhaust steam is discharged, leads direct to the inlet of a Prescott barometric condenser. The condensers for the eight engine units are installed in a row in the centre aisle between the two lines of engines. Under this row of condensers and below the present floor are the intake and discharge cisterns. This arrangement minimizes the amount of piping under vacuum.

The details of the condenser which is used are reproduced herewith. This condenser combines the advantageous principles of the original syphon condenser with those of the more modern barometric condenser. The entering steam is not interrupted in its flow by baffles, but passes straight down through a nozzle set in the top of the tail pipe. With the effect of this restricted discharge to which are added the inertia and gravity effects of the moving steam, an especially high velocity is obtained, which, combined with the effects of the cooling water, creates a vacuum without the use of air pumps except when starting the apparatus. The circulating pumps are operated just fast enough to raise the water one-half the height of the tail pipe and the vacuum created in the discharge nozzle serves to pull the water to the overflow point. The tail pipe consists of two concentric cylinders, one smaller than the other. Should the discharge nozzle become flooded any extra amount of water which cannot pass through the nozzle will overflow into the annular space and not raise the level to a point where damage can be done. The tail pipes of the eight barometric condensers are submerged in a common hotwell, the water of which is on a level with Lake Michigan. As this level does not vary, the likelihood of the tail pipes becoming unsealed is very remote.

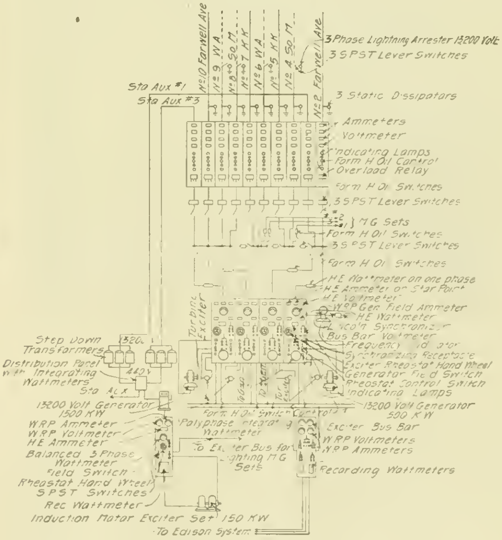
The circulating water is raised from the intake well by motor-driven centrifugal pumps mounted on the basement floor below the condensers and between the engine foundations. The air pumps are steam-driven and stand on the engine-room floor in a line with the condensers.



Commerce Street Power Plant, Milwaukee—Plan and Elevation of High-Pressure Piping for One-half of Station.



Commerce Street Power Plant, Milwaukee—Arrangement of Boiler Feed Piping.

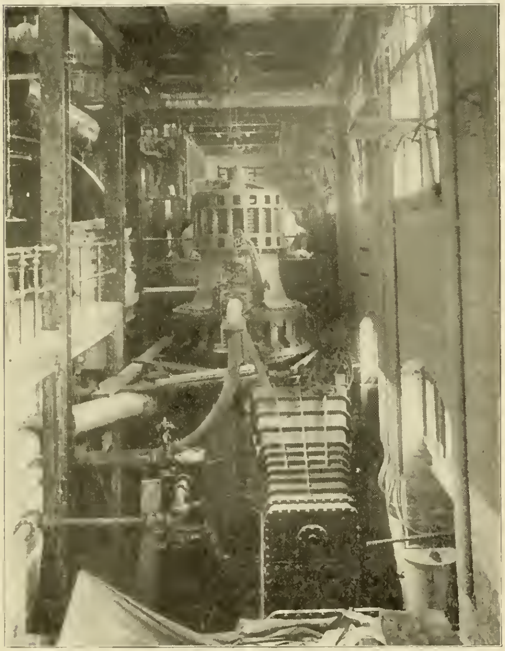


Commerce Street Power Plant, Milwaukee—Wiring Diagram of Three-Phase, 13,200-Volt Alternating-Current System.

The auxiliary boiler-feed piping system has its pressure maintained by four 18 and 10 x 18-inch duplex steam pumps. The feedwater is heated in four Hoppes heaters which, together with the pumps and auxiliary piping are installed in the basement between the two rows of boiler foundations. The exhaust from the stokers, boiler-feed pumps, dry-vacuum pumps and exciter turbines, together with the drips from the steam piping, are led to the heater and the amount of this exhaust adjusted to heat the feedwater to an economical temperature. The other auxiliaries throughout the building are motor driven as the use of any more exhaust steam for heating boiler feedwater would not be economical. One-half the equipment of boiler-feed pumps and heaters is placed in either half of the station, and the capacity of each set is sufficient for supplying the entire battery of boilers. In addition to the boiler-feed main which is laid out on the loop plan, each boiler is provided with a steam injector which can take its suction from a well in the floor in front of the boilers. This well is supplied with water from the low-pressure side of the feed system.

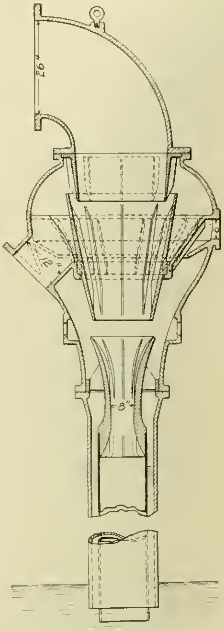
The accompanying vertical section across the aisle between the two rows of boilers, shows the arrangement of the boiler-feed pumps and auxiliary piping systems. In the basement with the boiler-feed pumps are two motor-driven air-compressor sets, each of 50 cubic feet capacity. The output of these compressors is used for various purposes throughout the power plant. Each half of the building has a motor-driven centrifugal pump which furnishes low-pressure feedwater for heating and injector purposes.

At the north end of the basement, between the boiler foundations, a very complete set of testing tanks with weighing scales, pump apparatus and condenser equipment has been installed. This experimental apparatus has its own separate piping system serving each boiler so that individual tests can be made on any apparatus in the plant. The 16 motor-driven blower fans for boiler force draft stand on the floor of this basement between the boiler foundations.



Commerce Street Power Plant, Milwaukee—One of the Vertical Units Under Construction.

The steam turbine equipment which has been installed under the balcony side of the engine room farthest away from the boiler consists of two 1,000-kilowatt capacity, 4-stage Curtis turbines with 60-cycle, 2,300-4,000-volt generators. Each turbine unit with its condenser equipment is independent of the other. The installation of auxiliaries for each unit includes a Prescott condenser with 4,000 square feet of 1-inch tubes, a steam-driven dry-vacuum pump, a motor-driven wet-vacuum pump and a motor-driven circulating pump. The pressure on the step bearings is maintained by two cross-connected, steam-driven pumps. The excitation for the turbine fields is furnished by a 150-kilowatt motor-generator set.



Commerce Street Power Plant, Milwaukee — Details of Prescott Barometric Condenser.

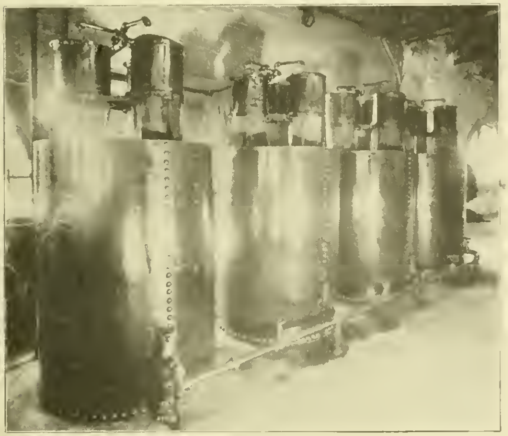
Electrical Apparatus and Control.

The switchboard for controling the output of the generators and handling the auxiliary current used throughout the power plant is mounted on the gallery which is at the level of the main engine cylinders. The board is made up of panels for controlling the following circuits: 60-cycle lighting feeder panels; 6 panels for distributing 3-phase current for single-phase arc lighting; panels for 19 single-phase, 60-cycle, 2,300-volt lighting feeders, each panel having a hand-throw, automatic-trip oil switch and wattmeter, voltmeter and ammeter and a double-throw, double-pole switch to control the motor-operated pressure regulators; 2 panels for controlling each of the two 500-kilowatt, synchronous-motor, phase-changing sets; 2 machine panels for the 1,000-kilowatt turbine sets which can be operated in parallel with the generators of the phase-changing sets; 4 remote-control panels for the 13,200-volt alternators; 2 exciter panels, of which one cuts in the Edison lighting network current for exciter purposes, and one controls an exciter set for the four large units (at the rear of these panels are motor-operated rheostats which are in series with the fields of the main 25-cycle alternators. These rheostats are used only in cases of emergency as the fields are readily excited in the turbine sets on the base of each engine, the current from which is controlled by a small rheostat mounted on the back of the switchboard panel and connecting in series with the exciter field); 10 remote-control, high-tension substation feeder panels; 10 direct-current railway feeder panels; 1 panel for a 600-volt tie line with the Oneida street generating station; 4 panels for controlling the 500-volt, 2,000-kilowatt, direct-current generators (these panels have motor-operated rheostats mounted at the rear of the switchboard); and panels for the control of the auxiliary motors throughout the building.

Two supply lines are carried to each of the auxiliary motors so that by means of a double-throw, double-pole switch, any motor can be operated with current taken from a generator in this plant or from the distribution network fed from other generating plants. The connections on the back of the large switchboard have been greatly simplified by the use of special lugs and castings for connecting the switch terminals with the busses.

The exciter circuits have been laid out with great care so that they are very flexible and do not form a weak point in the unit system which has been maintained throughout the power plant design. The motor-generator exciter sets, the small turbine exciters and the direct current available from the large generators in this station, and by means of tie lines from other stations, offer many possible combinations to prevent a shut-down from the lack of exciting current.

The busbar and oil-switch compartment is located below the engine-room floor and under the switchboard gallery. The current from the alternating-current generators, after passing potential and current transformers, is taken in cables under the floors through a motor-operated oil switch which connects or disconnects the generator from the three busbars built in separate fireproof septums. These busbars may be disconnected between the various sections by oil switches. From each of the machine sections of the busbars current is fed to the outgoing lines through line oil switches. The cable used in connecting the alternating-current circuits is insulated with varnished cambric and installed in bituminized fiber conduits placed below the floor level. A single oil switch connects five feeder switches with that section of the busbars fed by one generator so that with the sectionalized switches in the busbar compartments the unit system is maintained. In accord with this policy of the unit system, two feeder cables are run to each substation. Each of these feeders is taken off a busbar section from a different unit. The two substations nearest this plant each have one of their connecting feeder lines above ground and the other in conduit underground.



Commerce Street Power Plant, Milwaukee—Oil Tanks and Filters.

There are four railway and lighting substations fed from the Commerce street plant. A substation at South Milwaukee has one 500-kilowatt rotary converter for railway use and one 150-kilowatt induction motor belted to a 60-cycle lighting generator. A new substation at West Allis has two 1,000-kilowatt, 6-phase rotary converters and a lighting equipment similar to that in the South Milwaukee substation. A substation at Farwell avenue has two 500-kilowatt rotary converters and the substation at the Kinikinic repair shops has two 1,000-kilowatt rotary converters. The overhead network fed by all of these substations is tied together in multiple with the Commerce street and Oneida street power plants through independent tie lines and trolley wires.

Oiling System.

The Commerce street plant has a gravity oiling system. Pressure is maintained by storing the oil in 10 tanks with strainers, in the uppermost gallery over the switchboard. Oil is pumped to these tanks from steel supply tanks located in the basement near a driveway, so that oil barrels can be skidded from wagons to the top of the tanks and thus emptied. The steam-driven pumps which raise the oil to the elevated tanks are installed in the bottom of the supply tanks in the basement, so that they are at all times flooded with oil.

Near the oil tanks in the basement a room has been set apart for cleaning and drying waste. From the engine-room floor above a hopper leads to the waste room. The bottom of this hopper is directly above a centrifugal dryer operated by a vertical steam turbine. When dirty waste has had the oil extracted in this dryer it is transferred to a nearby steam washing tank, from which it can again be transferred to another centrifugal dryer, and then made ready for second use by thoroughly drying on a steam coil arranged as a rack for holding the waste. The oil which is extracted by the centrifugal dryer runs by gravity to a small tank on the floor of the room. In this tank is a small steam pump which raises the oil to a series of five settling tanks for separating the oil from the waste. From the last one of these tanks the oil is piped to the supply tank of the power plant oiling system.

NEW BUILDINGS OF THE GALESBURG & KEWANEE ELECTRIC RAILWAY.

The Galesburg & Kewanee Electric Railway operates over about 5 miles of track located mainly within the city of Kewanee, Ill., except for a short extension into the town of Weathersfield. During the present year the line will be extended to Galva, 8 miles west of Kewanee. This will form the first link in the chain of lines planned to connect Kewanee and Galesburg, Ill. Although the mileage of the Kewanee road is small its power house and car barns are particularly well constructed with a view to caring for the future extensions. These buildings are located at Weathersfield.

The power house has a floor area of 70x115 feet. The generating equipment consists of a 700-horsepower, cross-compound, horizontal Buckeye engine direct-connected to a General Electric 400-kilowatt railway generator. This unit occupies but one-half of the engine room. The remaining space will accommodate a similar future installation. Water for station use is ordinarily obtained from a 1,400-foot well. A large elevated water tank has recently been erected which, in addition to supplying feed-water to the boilers, provides a supply of water for fire protection. To prevent trouble from ice a steam coil is placed in the bottom of the tank. An 8-inch service main delivers water under approximately 60 pounds pressure from the tank to the power house.

The boiler room contains two Bonus-Kewanee water-tube boilers with a rated capacity of 350 horsepower each. Coal is obtained from a nearby steam railroad and is delivered in small cars to the bunkers which join the boiler room. Draught is furnished by a brick stack 150 feet high.

A new car barn has been built across the street from the power house. This structure has a floor space of 80 x 141 feet. The building is constructed of brick and is divided into three bays of fireproof walls extending throughout the length of the barn. The main bay, located in the centre of the building, is 33 feet wide and is used for car inspection and repair work. At the rear a space 55 feet long is partitioned off for use as a paint shop. Concrete pits are provided under the two tracks entering the middle bay and under one track in the paint shop. The floors in this portion of the building are of concrete. The west bay is used for car storage. This room is 24 feet wide and has two tracks leading direct from the street. The offices, machine and blacksmith shops and two general storerooms are located in the east bay and are separated from each other by brick walls. The machine shop is 44 x 20 feet in floor area and is equipped with motor-driven lathes and other tools for facilitating repair work. The shop is served by a 1½-ton crane. The crane travels on two 12-inch I-beams connecting at the door leading to the middle bay with another conveyor which operates transversely in the repair room. This affords a means of transportation from the repair room to any part of the machine shop.

THE STATUS OF THE CHICAGO TRACTION PROBLEM.

BY LOUIS ALBERT LAMB.

After nearly half a century of controversy the supreme court of the United States, on March 12, 1906, decided once for all the famous dispute over the Acts of 1859, 1861 and 1865, on which rested the so-called "99-year" claims of the Chicago street railways. Without repeating what is universally known, it will clarify the case under discussion to say briefly that the mandate of the court as voiced by Mr. Justice Day was of epochal moment in that it laid down as a principle of construction the thesis that "Corporate privileges can only be held to be granted as against public rights when conferred in explicit terms." The particular importance of the decision was that it overthrew the principal claims of the companies under the legislative grants; and established as the limit of their tenure of many important parts of their systems the time of "purchase by the city."

To appreciate the gravity of this adjudication of the "99-year acts" it must be considered that the foremost lawyers and jurists of the country had been called on at various times to construe the acts of the general assembly on which the corporations rested their policies and their hopes; and almost without exception these eminent men had held that the rights of the companies were invulnerable and indefeasible.

So confident of this were the ruling interests of the several companies that they regarded as an arrant absurdity any intimation that the review of the supreme court might invalidate or impair the force of the act of 1865. In an argument before Judge Grosscup on June 18, 1903, Mr. Auerbach, speaking for the counsel of the Union Traction Company, used the following words:

> "Upon the faith of these decisions vast amounts of capital have been expended. . . . The credit of these corporations, their ability to make improvements necessary for public service, and possibly their very existence are dependent upon the rights which have been held to be vested in them by the decisions referred to. directly or indirectly the entire investment has been made upon the faith of the act of 1865. If the act of 1865 is invalid and unconstitutional perhaps there is little more for these corporations to hope for than to be wound up by the officers of the court."

Well, the supreme court declared the act to be "not unconstitutional"; but it construed its grants in futurity in such a way that the words of Mr. Auerbach read almost like prophecy. Even now a corporation has been formed under the style of the Chicago Railways Company, with a directorate representing all the parties at interest, to be the instrumentality by which the traction enterprises are to be continued, if and when, and as soon as, the city gives such grants or franchises as will permit of the essential financial undertakings. That is to say, an organization already exists for the carrying out of the event contemplated by Mr. Auerbach in his prophetic utterance of 1903.

The immediate sequel of the decision of the supreme court in the 99-year case was the submission to, and adoption by, the electorate of Chicago of the following referendum propositions:

(1) To allow the city to purchase and maintain the street railway properties but not to operate them as municipal undertakings.

(2) To authorize the issuance of $75,000,000 of street railway certificates, against a pledge of the properties and their earnings, for the purchase of the lines.

(3) Refusing to permit the city to grant franchises to private corporations.

Progress along the lines of the mandatory referendum has been limited to somewhat fruitless negotiations between the city and the corporations. The main ground thus far attained is a definite appraisal of the physical plants by their owners as a basis of negotiations for purchase by the city. Leaving out of account the value of unexpired franchises, the City Railway Company inventories its tangible property at $20,103,907, and the Union Traction Company appraises its property, exclusive of franchise value and the value of its ownership in the Consolidated Traction Company, at $27,401,219. These valuations are understood to be the reproduction costs of the properties for street railway purposes, depreciation deducted.

According to the best possible estimates it will be necessary to expend a minimum of $35,000,000 on the properties, as they are, to rehabilitate them according to present standards and to make them capable of giving the public service demanded by the people and the city authorities. Thus it is evident that the $75,000,000 of Mueller certificates which the city may issue, even if they were accepted without discount to cover the risks of the industry under a new and inexperienced proprietorship, or the uncertainties of futurity, would be insufficient to cover the appraised value of the plants and the cost of the needed improvements. The deficiency, though considerable, would be much increased by the necessity of paying the present value of the unexpired franchises on a fair basis of capitalization. And beyond this item would remain the cost of the feeder line system on which the traffic of the trunk lines largely depends.

As to the validity of the Mueller certificates there has been no judicial determination, consequently there is no assurance that the city will be able to float them at the minimum price fixed by the enabling act, if they can find purchasers at all. A test suit to determine the validity of the issue is a condition precedent to any further steps and such a suit is being, or will be, speedily arranged. Meantime the ambition of the city administration to become a railway proprietor must be held in check.

As a result of the 99-year decision and of the referendum vote of April, 1906, it became necessary or expedient for the city to give the present tenants of the streets operating licenses to bridge the hiatus between the expiration of their franchises down town and the qualification of the municipality to effect a purchase. After an extraordinary display of patience the Federal government, pursuant to an act of Congress, finally made an imperative demand on the city for the abatement of the nuisance which had long obstructed or impeded the navigation in the Chicago river, namely, the arches and crowns of the La Salle street and Washington street tunnels. It will be recalled that these tunnels are the property of the city, and it would seem to be within reason to suppose that a corporation desirous to possess a railway system worth a hundred million dollars should feel competent to deal with the trivial feat of lowering the roofs of tunnels, especially as such repairs and alterations are the commonplaces of railway ownership and administration. But the fact is that the city found itself unprepared to cope with the situation unaided and was literally compelled either to destroy these valuable tunnels or to invoke the aid and resources of the Union Traction Company to save them and at the same time to comply with the requirements of the government. That is to say, the city, committed as it is to the general proposition that the private corporations are ill-fitted to perform quasi-public functions in ordinary, was glad enough to accept their services to meet an emergency. Further comment would be an offense to the reader's intelligence.

It is one of the strongest arguments in favor of private initiative and management that they create automatically operating machinery for the furtherance of corporate objects. To such an organism there is no day, no night, no vacation season, no fatigue, no illness, no death—some appropriate part of its fabric is alert ceaselessly to seize for the corporate benefit any advantage which appears. Naturally, therefore, the managers of the West and North Side lines perceived the tactical value of the tunnel exigency and were prompt to turn it to their own benefit. They undertook to carry out the work necessary to provide 22 feet of water over the crowns of the city's tunnels in consideration, among other things, of an ordinance allowing them to operate electrically their lines now using cable power or horses; and empowering them to install the overhead contact system of propulsion; and permitting them to cross the river by specified bridges during the reconstruction of the tunnels. A similar ordinance was granted to the City Railway Company. These grants are of indefinite duration, but may not be revoked prior to January 1, 1907. To guess that they will remain in force a much longer time than the city authorities intended when they were given is not out of reason. It is practically certain that the end of the present calendar year will see the abandonment of the cable in all parts of the metropolitan district and the installation of facilities for a thoroughly satisfactory service, though necessarily not an ornamental or fancy plant. The esthetic element in public-service undertakings is to be had only in consideration of long-term or perpetual franchises.

In passing it is worth while to observe that within three days after the acceptance of the trolley ordinance the Adams street service of the Union Traction Company, which had been operated east of the river by horse-power, was using electricity. Full provision for an immediate transition had been made in advance of the passage of the enabling ordinance. This is a characteristic of the methods which have given private corporations so large a measure of efficiency and success in handling public utilities. Municipalities fall far short of such promptitude in adapting themselves to new conditions and requirements.

The situation reduced to its simplest terms may be described thus:

(1) The claims of the street railway companies to vast franchise values under the 99-year act have been brushed away, and with them, in all likelihood, a large part of the value behind a considerable amount of street railway capital has been reduced to zero. This eventuality is one which the underwriters, subscribers and purchasers of these securities should in reason have contemplated as a possibility before they advanced money on them. Until the legality of the 99-year act had been affirmed the possibility of its invalidation always must have been a perfectly visible hazard—though seemingly most remote—and as such it should have been adequately insured. Caveat emptor is the hard rule of trade and the buyer of a security is supposed to have determined, and to have exacted an equivalent for, all the risks involved.

(2) The city of Chicago may be supposed to stand committed to the policy of municipal ownership subject to judicial affirmation of the legality of the means proposed to bring it about.

(3) The people have declared against municipal operation, such declaration constituting a vote of no confidence in the efficacy of a political organization as an agency for railway operation.

(4) The people, represented in the city council, have voted confidence in the good faith of the present tenants and managers of the street railway systems by granting indefinite operating licenses and permitting them to install the overhead trolley system, which is the only known system adapted to give a public service adequate to the stern requirements of a dense traffic in a limited area. Moreover the city has testified its appreciation of the efficiency of private corporations in quasi-public emergencies, such as the tunnel-lowering problem presented, and has deemed it wise to entrust to a private corporation the duty of dealing with a concrete case.

(5) The present tenants of the streets have taken up with vigor and address the task of providing a satisfactory transportation service to the public, as far as they are enabled to do so in justice to their stockholders, under the meager terms of the ordinances of June 18, 1906.

Looking into the future some things may be said without fear of refutation by events. The city of Chicago, if it shall effect the purchase of the street car properties must accept all the hazards and the responsibility to the electorate which in the past have been borne by private capital seeking profitable use and a fair increment. These risks, it goes without saying, constitute a very grave and serious impairment of the utility of the capital involved. They reduce the "present value of future obligations" and they will, in the future, as in the past, make it difficult to obtain as much capital as might be employed advantageously. There is no law whereby the city of Chicago can claim exemption from the operation of hazards in impairing the utility of capital. In the second place, it will be found, if the city is successful in purchasing the lines, that governmental functions and highly specialized railway operating details cannot be administered by a governmental executive. In other words, it will be found absolutely necessary to delegate to trained managers of transportation machinery the conduct of the street car systems. The great complexity of this function will necessarily imply a corporate agency, designed, organized and existing, to return profits to the individual proprietors composing it. Altruistic industry is a feature of Utopia, not of American municipalities and much less of American corporations.

Contrary to almost universal lay opinion the conduct of an intra-mural street railway system of 1,000 miles of trackage is an immensely difficult task considered apart from any conditions of return on capital or of maximum convenience to the passengers. The inhibition of freight carriage involves at the outset a condition of absolute disutility of the entire capital investment during one hour in every six. This vast economic waste is countenanced on the theory that it concentrates all the facilities of the operating plant in activities for the safety and convenience of passengers; but few ever think that it lies at the root of the hazards which invariably surround and beset all but the oldest city traction enterprises in regions of the greatest traffic density.

To engage executive capacity of an order fit to cope with such initial difficulties and such operating complexities is quite unlike hiring ability to perform empiric tasks in conventional ways. As well expect to engage military genius of the Napoleonic order from the recruit squad at $13 a month. Only by the incessant adaptation of means and methods to constantly varying conditions can success be wrenched from the passenger business of a city of the Chicago type. And the price of such management is the personal enrichment of the man, or men, who can co-operate to achieve such a success. If the man be a general of the Yerkes type he will enrich himself individually; if it be a corporation of proprietors like the City Railway company the stockholders will enrich themselves. The doctrinaires of this city have inveighed for years against private control of the carrying industry but not one of them has yet undertaken an analysis of the hazards, disutilities and limitations which have constantly harassed and impaired the capital devoted to the service of the public. They have delighted in analyses showing that the cost of carrying a passenger is less than 5 cents but they have been unable to perceive that this margin of net earnings is the contribution of a few miles of trunk line in the region of densest traffic, without which the systems as a whole must have shown total costs per passenger carried either in excess of the 5-cent fare or so little under it as to make impossible the payment of adequate dividends on the proprietary capital. Apart from this indisputable fact of necessarily high unit cost on the lateral line networks, the troubles of the traction corporations have flowed very largely from the fact that their franchises have been continually in dispute, setting up reasonable doubts as to the permanency of the right to operate, and fostering an injurious disregard of sound accountancy with respect of depreciation and impairment of assets; with the correlative result that dividends have been distributed in excess of the actual profit-earning capacity of the properties as a scientific audit would have determined divisible profits over all depreciation.

That the city of Chicago would not fall into the same errors of self-deception which have allured the private corporations is too much to hope. The report of eminent certified accountants in the matter of electric lighting costs under municipal operation clearly revealed the proneness of city officials to figure unit cost without accurate "expense loading," thereby setting up a claim of great economy which scientific accountancy could not sustain.

By reason of the heavy underwriting discounts which are characteristic of most undertakings of the quasi-public kind, the holders of street railway capital have been willing —or even constrained—to permit their money to be tied up unproductively for months or years while new traffic territory was developing to a profitable volume. The securities representing this invested capital, being traded in the open market on the exchanges, have fluctuated with the varying prospects of the enterprise, permitting an incessant transfer of the hazards from those less capable to those more capable of carrying them. That is to say, the machinery of speculation, though employed by individuals for personal profit or indemnification, has been the indirect instrumentality of furnishing to the public at a price very near actual cost, the carrying service so essential in a great community. In other words the successive ownership by many holders of securities involving risk of a high order, distributes the hazard in an ideal way among the many who are capable of accepting and carrying it, without which distribution the community would be deprived for some time of the benefits of the undertaking.

That the municipality, which is merely an instrument of the sovereignty for more convenient local government, should assume such hazards as are certain to arise in the development of transportation service in a community like Chicago is beyond credence. Certain it is that it could not thus extend its function without explicit authority to resort to its general credit to indemnify losses incurred through the assumption of bad risks. Such authorization has not thus far been granted by the general assembly, and it is in a high degree improbable that legislation fraught with so much danger in the present condition of city administration can be obtained without a prolonged propaganda.

It is manifest at least that the municipality cannot make use of the speculative machinery either directly or indirectly to free itself of the costly uncertainties of railway landlordism.

In the end, it may be said with scarcely a shade of doubt, the city of Chicago will be compelled by the force of fundamental principles, to invoke the aid of a private corporation, highly specialized in the functions of transportation, to carry on its traction service. In the nature of the case it will be necessary to grant this corporation a franchise of such a character as will justify an adequate investment and insure an adequate return for the use of this capital. It is almost certain that the wise policy of Massachusetts will be adopted, and that the private corporation will be secure in its privileges so long as it acts efficiently and in good faith for the common welfare.

The formation of the Chicago Railway companies represents the conviction of those most deeply concerned in the present controversy, that the city will find it expedient or necessary to delegate to a private corporate agency the management of the traction business. The purchase by the eastern syndicate of the Chicago City Railway company's stock was another expression of the same belief. Only by such delegation will it be possible for the public to obtain the use of the enormous amount of capital required for the development of the carrying facilities of our municipal empire. And the overwhelming probability is that a single corporation will undertake the administration of all the lines in the corporate limits, on terms of such liberality and with so great efficiency that the people will marvel that they ever dreamed of the hybridization of Government and Railway Ownership. Plenary powers of regulation in the hands of the municipal authorities will correct any abuses which may arise; and equitable exactions of compensation for public privileges will remove forever the danger of "exploitation of the people" for the benefit of the corporation using the streets. Let the grants to this corporation be drawn in such a way that self-interest, if nothing else, will suggest the maintenance of the capital assets unimpaired, so that in the event of a compulsory sale full value may be recovered for the security holders.

Of the multiplicity of suits now pending touching the complex capitalization of the Union Traction system it is too early to speak in detail. Considering the calamitous decision of the supreme court in the 99-year act it seems inevitable that much of the capital must be wiped out or scaled to a small fraction of its face value. But the successor corporation may be trusted to deal equitably in the premises. A righteous Federal court has lopped off a large fictitious value from the lien of these securities; but the conservation of the residue rests with courts whose principle of action was well expressed by Judge Grosscup in the Guaranty Trust case: "The function of the court is to protect rights, not to confiscate them or to make them the subject of donation to anybody."

Those who advocate municipalization stoutly deny that the traction industry is hazardous; but their denial has small weight with sober persons who have taken the trouble to compare the quotations of 1899 with those ruling to-day. And if street railroading is beset with risks it is the function of private capital to accept them and the function of individual genius to direct the corporate machinery which, in the hope of adequate rewards, he is willing to devise and put in operation.

And when the traction industry ceases to be hazardous its returns on invested capital will be measured by the rate of income on government loans—then municipal ownership will be the logical status, and not until then.

Electrical Transmission by Water-Power versus Coal.

Referring to the projects for a great electrical plant to be operated by the Victoria falls of the Zambesi river in Africa, Mr. W. E. Curtis quotes a mining expert from that country as saying Victoria falls is doubtless capable of furnishing any amount of power, and the water above and below flows in such a way that it can be easily handled, but he is not sanguine as to the immediate realization of the plan. No plant has yet been erected, none has been contracted for, and the enterprise is merely in the talking stage. English, German, French and American engineers have all been making examinations and estimates, and they calculate that not less than 500,000 horsepower is available, while 150,000 horsepower would meet present requirements. The utilization of this power, however, involves a problem of economy—how far electricity can be transmitted in competition with coal. Johannesburg is between 600 and 700 miles distant, and there the power is mostly needed. Power is now sent 140 miles from the Yuba river to Oakland, Cal., and at several other places it is carried more than 100 miles, but seven times that distance would involve a great deal of wastage, and, although the water is free and the construction would not be very expensive, yet between the falls and Buluwayo there is a good seam of bituminous coal.

COLD SPRINGS SHOPS, INTERNATIONAL RAILWAY COMPANY, BUFFALO.

The Cold Springs shops and car houses of the International Railway Company of Buffalo, N. Y., cover a 10-acre tract located at the intersection of Main and Michigan streets in Buffalo. The company has for some time had in progress the work of rearranging and improving these shops, much of which has been accomplished, and in view of the articles descriptive of the new construction which will appear from time to time, a general reference to the layout will be of interest.

The property has a length of 693 feet. Referring to the diagram, on which no attempt has been made to show details, the various buildings and sections are:

A. The new car house described on page 404 of this issue.

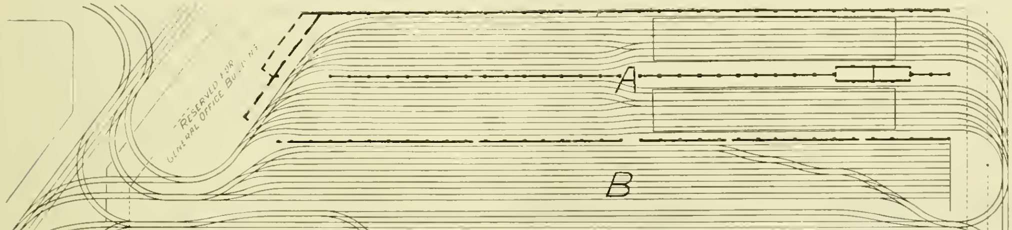
B. Outside storage tracks and service tracks for car house, over which a house may be erected at some future time.

C. Store house; this was formerly used as a carpenter shop.

D. Present machine shop, to be used for lumber storage and dry kiln; the dry kiln will be a fireproof structure replacing the east portion of the present building.

E. Present armature room; this is to be refitted inside.

F. To be refitted for a machine shop, and wheel changing shop. Additional machinery and a new transfer table are to be installed.



Cold Springs Shops, International Railway Company, Buffalo—General Plan.

G. Truck shop; this comprises the west portion of the old car house which is now replaced by A. This is described on page 406 of this issue.

H. Forge shop, iron room and boiler plant. This is an old building practically rebuilt. An important change was to place a skylight 35 x 16 feet in the roof of the forge shop. The equipment of the forge shop is new and comprises one 1,100-pound Bell steam hammer, one Bradley helve hammer and seven Buffalo down-draft forges. The iron room is used for the storage of iron, dies for drop-forging, special tools, etc.; the shear and punch, formerly belt driven, but now operated by a Walker 30-horsepower motor, is located here. The boiler room has three 120-horsepower Lake Erie boilers which supply steam for heating the plant and driving steam hammers in the forge shop. In the basement of the boiler

Cold Springs Shops, International Railway Company, Buffalo, Forge Shop.

room are located pumps to which the drains from the heating system return by gravity. Shavings from the carpenter shop are blown to the boiler house and used for fuel.

K. Carpenter shop and mill; this was formerly the east portion of the car house.

L. New paint shop. The illustration shows the general construction of this shop, which is 256 x 110 feet; the rafters hung at the ends in iron stirrups will be noted. The heaters for this shop are of novel design, consisting of sets of three coils, each of 11 pipes 22 feet long, supported on cast iron standards which are fastened to the floor; the heaters are covered on the sides and ends by plates of galvanized iron, so that the heated air rises, creating a draft over the heater coils, and at the same time the car panels directly opposite the heaters are protected against too high temperatures that might blister them.

Cold Springs Shops, International Railway Company, Buffalo—New Paint Shop, Showing Heaters.

Cold Springs Shops, International Railway Company, Buffalo—Stock and Mixing Room of Paint Shop.

M. Storage tracks for shop.

N. New oil storage house.

It is reported that the Inter-Urban Railway Company, of Des Moines, Ia., will soon be ready to furnish farmers along the right of way with current for light and power purposes.

STEAM RAILROAD OFFICIALS DISCUSS ELECTRICAL OPERATION.

The annual conventions of the Master Car Builders' and the American Railway Master Mechanics' Associations were held at Atlantic City, N. J., June 13 to 20. From the standpoint of those interested in electric railway work the principal features at the convention were the exhibits of electric locomotives and motor cars. There were shown an electric locomotive and electric motor cars for use on the New York Central lines and the Pennsylvania's West Jersey & Seashore branch from Camden to Atlantic City. The Union Pacific gasoline motor car No. 7 was also on exhibition, having run with its own power from Kansas City.

The only paper pertaining to electric railways read at the conventions was the report of the committee on "Electricity on Steam Railroads," of the Master Mechanics' association. The committee was instructed to report on the relative advantages of the different systems of electric traction now in use as applied to interurban and suburban lines; the relative cost of operating such lines by electricity and steam, and the different systems of gasoline, gasoline-electric and steam motor cars. Main line operation was not considered and the paper dealt only with passenger service on branch lines, suburban and interurban lines which are feeders to main lines.

In the first place, the report gave a brief review of the development of electric traction on street and suburban lines, showing how electricity has replaced animal and cable power and how electric cars have increased in size and power.

It was stated that the density of traffic is the ruling factor as to whether the steam or the electric road will prove more profitable. On old established lines it is difficult to estimate the amount of traffic induced by increased train service, and unless there is a reasonable basis of expectation for such traffic the steam railway that can fully care for its own is not in need of a new sytem. Where there is a sufficient density of traffic it will pay steam roads to handle their local suburban and interurban service electrically and induce traffic by lower rates, frequency of service, frequent stops and the absence of cinders and smoke. Traffic of this kind should have its separate tracks, as it would otherwise get in the way of fast trains and would itself be impeded by slow freight trains.

In regard to the relative advantages of the alternating current and the direct current, the committee considered that long-distance distribution is best accomplished by alternating current of high voltage and that single-phase operation is economical on account of the high voltage used on the line and cheapens very much the cost of distribution from the substations. The car equipments for alternating current are more expensive than direct-current apparatus and their extra cost must be weighed as against the low cost of direct-current machinery and more expensive distribution to the line.

The relative costs of operation with electricity and steam are difficult to state as there is very little accurate information of value, and the results obtained by attempting to draw comparisons from hypothetical roads would depend entirely upon the assumptions that were made.

The subject of gasoline, gasoline-electric and steam motor cars was discussed rather in detail and short descriptions were given of the Strang gasoline-electric car with storage battery, the Delaware & Hudson gasoline-electric car without batteries, the Union Pacific gasoline motor car No. 7, and the steam motor cars being experimented with by the Erie, the Canadian Pacific and the Florida East Coast railroads.

It was recognized that the motor car carrying its own power plant occupies a distinct field of usefulness.

ANNUAL MEETING, STREET RAILWAY ASSOCIATION OF THE STATE OF NEW YORK.

The twenty-fourth annual meeting of the Street Railway Association of the State of New York was held at the Grand Union Hotel, Saratoga Springs, N. Y., on Tuesday and Wednesday, June 26 and 27. The opening session was called to order at 10:30 a. m. on Tuesday by the president, R. E. Danforth, general manager of the Rochester Railway Company. On motion the list of registrations with the secretary was substituted in lieu of the roll call, and the president then read his annual address, covering the work of the association for the year just past..

President's Address.

The past year has been fruitful of many events of importance to the electric railways of this state, chief among which are the change in policy regarding electric railways by the steam railroads and the entrance of such railroads into the electric traction field.

While New York has been for years notably backward in the development of interurban lines, it undoubtedly leads today all other states in the newly established community of interest between steam and electric railways in the electrification of a heavy steam railroad terminal and in the successful operation of electric cars over tracks in regular and frequent use by heavy trunk line steam traffic. The extension of this latter class of service on the tracks of the West Shore railroad, between Rome and Syracuse, by the operation of cars of the Utica & Mohawk Valley Railway Company, will be an established fact before the close of this year. The joint operation of steam and electric trains between the points named will be closely studied by railroad officials of both classes of service throughout the country. It might be well to note at this time that a protected third rail is to be used instead of the overhead trolley, to transmit curent for the electric cars.

Far-sighted railroad men see the necessity of offsetting the inroads into their freight and passenger earnings made by parallel electric lines, by furnishing equivalent service, on their own tracks, by the use of electric cars operated at high speed and frequent intervals. Plans have been prepared and, I understand, some contracts have been let for the electrification of certain branches of a number of the steam trunk lines in this state. The successful operation of long interurban lines in direct competition with steam railroads has already impressed the steam railroads with the obvious advantages in the use of electric power for the operation of passenger and of some classes of freight trains. For years there has been more or less open warfare between steam and electric interests, and we note with pleasure the change in conditions as above outlined.

The business prosperity enjoyed by the country at large continues to favorably affect the receipts of the steam railways of this state and will, apparently, continue during the entire year. The report of the railroad commissioners shows that the gross earnings of 106 street railways of the state of New York, for the year ending June 30, 1905, were $70,730,085.66, an average of $33,684.20 per mile of road, showing an increase over the preceding year of $1,134.48 per mile. It is interesting to note that the steam surface railroads' report for the same time shows gross earnings from operation, per mile of road operated, $19,034.35.

The transmission of Niagara Falls power to Syracuse marks a new epoch, and brings more nearly an accomplished fact—the operation of trains on all railroads by electricity.

Public sentiment regarding street railways is assuming varied forms; in some places, the tendency is toward municipal ownership; in others, to a liberal treatment of public service corporations, only requiring in return, a fair and honest service. Tendencies—almost anarchistic—are clearly shown by people of one city, while those in another advocate strongly corporate ownership of public utilities with a wise and just form of municipal supervision. The members of this association can best offset the growing demand for municipal ownership of public utilities by giving the public adequate service and by pointing out the evils attending municipal ownership.

The work of the Civic Federation in obtaining accurate information concerning the results of municipal ownership of public utilities in Europe will give us ammunition necessary to overcome the forces now working against corporate interests.

During this winter your executive committee has called two special conferences of the members for the informal discussion of various problems arising in the operation of street railways. At the January conference held in Schenectady, on January 10, subjects relating to the maintenance of cars and equipment were thoroughly discussed. This meeting was attended by the master mechanics and mechanical engineers of nearly all the railways in the state and by a number of others from neighboring cities and Canada. At the meeting held in Elmira in March problems of the transportation department were discussed.

Both meetings have satisfied your executive committee that an opportunity for various departmental officials to meet together for an informal heart to heart discussion of the problems which they have to overcome, is not only appreciated by such officials, but does much to increase their efficiency. It is not to be expected that the railways in Greater New York receive, directly, a great amount of material good through a discussion of various topics of this association; they do, however, gain in the fact that through their work in the association they are educating men whom they may some time find it advantageous to employ and, in turn, through their advice given at these meetings and through the exploitation of their system, greatly aid the other railroads in the state in improving their operating methods and, incidentally, their earnings.

At the annual meeting last year a resolution was adopted and referred to the executive committee for further consideration and report on the proposition of obtaining the appointment of a commission to revise Article 4 of the Railroad Law, authorizing the expenditure of such moneys as may be necessary for the expense of this commission, from the regular funds of the association or from the proceeds of the special assessment heretofore authorized. Your executive committee advises deferring action of this character for at least another year.

Your executive committee would like to have, for the benefit of those whom you may elect for the ensuing year, an expression of your opinion, as an association, of the advisability of continuing these special meetings, and of having the annual meeting in June.

By consolidations and withdrawals of several roads our membership has been reduced to 36 roads.

Your executive committee recommends a change in the constitution and by-laws which will permit electric railroads in adjoining states and Canada to become associate members and also recommends a revision of the dues as now levied upon active members. By cutting out all unnecessary expense the maximum dues may be materially reduced and the roads placed upon a more equitable basis. This association has been in existence for 24 years, and its policy has changed, from time to time, with the change in conditions. We are all alive to the fact that we have reached another turning point and must decide at this meeting the future policy of the association.

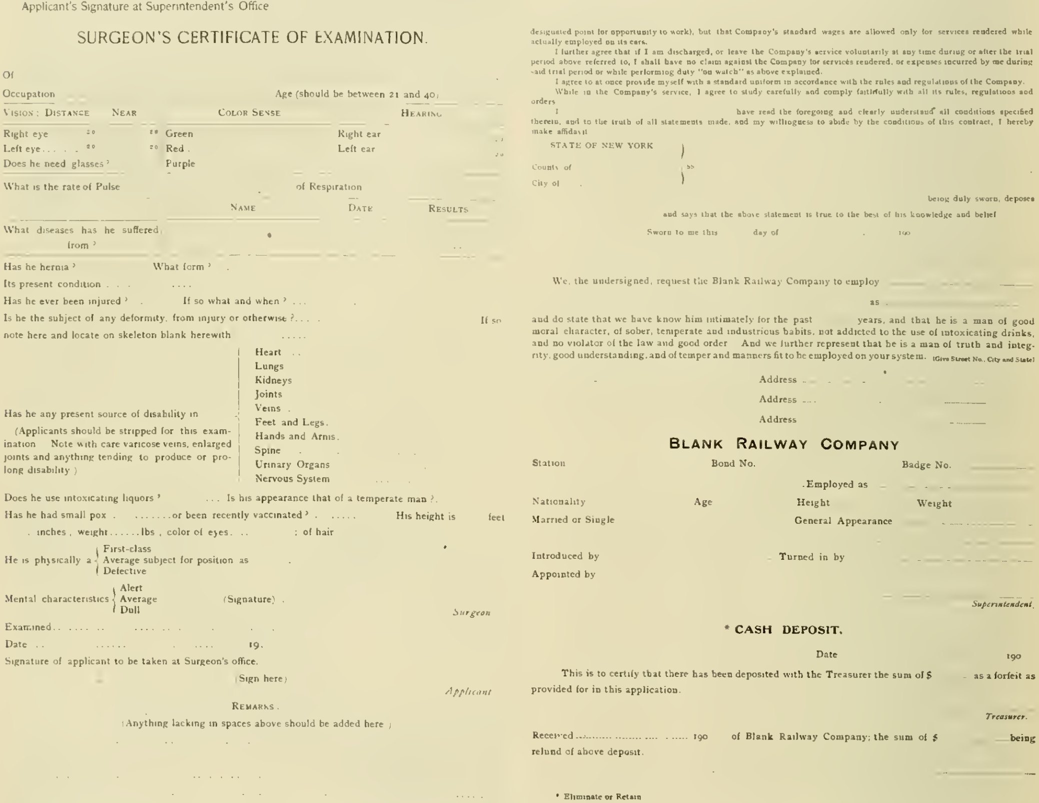
Your respective committees have prepared careful reports on the subjects assigned them and several important papers are to be read and discussed.

In closing I desire to express my appreciation of the hearty co-operation I have received from the various members during the past year, and will ask all the members present to aid me in making this a most profitable convention.

The secretary, C. B. Fairchild, Jr., then presented the report of the executive committee, including its minutes of meetings held at New York, October 12; Rochester, December 9; Elmira, March 29, and Albany, May 19, which was approved.

The report of the treasurer, W. W. Cole, Elmira, showed a balance June 30, 1905, of $2,253.25; receipts for the year, $5,266.00; expenses for the year to date, $5,114.79; balance on hand, $2,404.46. The report was approved.

The secretary announced the program of entertainments and read letters of regret at their inability to attend the meeting, from the governor of New York and from President Ely of the American Street & Interurban Railway Association.



Applicant's Signature at Superintendent's Office

SURGEON'S CERTIFICATE OF EXAMINATION.

Of

Occupation Age (should be between 21 and 40)

VISION: DISTANCE	NEAR	COLOR SENSE	HEARING
Right eye 20	20	Green	Right ear
Left eye 20	20	Red	Left ear
Does he need glasses?		Purple	

What is the rate of Pulse of Respiration

	NAME	DATE	RESULTS
What diseases has he suffered from?			

Has he hernia? What form?

Its present condition

Has he ever been injured? If so what and when?

Is he the subject of any deformity, from injury or otherwise? If so note here and locate on skeleton blank herewith

Has he any present source of disability in
- Heart
- Lungs
- Kidneys
- Joints
- Veins
- Feet and Legs
- Hands and Arms
- Spine
- Urinary Organs
- Nervous System

(Applicants should be stripped for this examination. Note with care varicose veins, enlarged joints and anything tending to produce or prolong disability.)

Does he use intoxicating liquors? Is his appearance that of a temperate man?

Has he had small pox or been recently vaccinated? His height is feet inches, weight lbs, color of eyes; of hair

He is physically a
- First-class
- Average
- Defective

subject for position as

Mental characteristics
- Alert
- Average
- Dull

(Signature)

Surgeon

Examined

Date 19.

Signature of applicant to be taken at Surgeon's office.

(Sign here)

Applicant

REMARKS.

(Anything lacking in spaces above should be added here.)

designated point for opportunity to work), but that Company's standard wages are allowed only for services rendered while actually employed on its cars.

I further agree that if I am discharged, or leave the Company's service voluntarily at any time during or after the trial period above referred to, I shall have no claim against the Company for services rendered, or expenses incurred by me during said trial period or while performing duty "on watch" as above explained.

I agree to at once provide myself with a standard uniform in accordance with the rules and regulations of the Company.

While in the Company's service, I agree to study carefully and comply faithfully with all its rules, regulations and orders.

I have read the foregoing and clearly understand all conditions specified therein, and to the truth of all statements made, and my willingness to abide by the conditions of this contract, I hereby make affidavit.

STATE OF NEW YORK }
County of } ss
City of }

being duly sworn, deposes and says that the above statement is true to the best of his knowledge and belief.

Sworn to me this day of 190

We, the undersigned, request the Blank Railway Company to employ as

and do state that we have know him intimately for the past years, and that he is a man of good moral character, of sober, temperate and industrious habits, not addicted to the use of intoxicating drinks, and no violator of the law and good order. And we further represent that he is a man of truth and integrity, good understanding, and of temper and manners fit to be employed on your system. (Give Street No., City and State)

Address
Address
Address

BLANK RAILWAY COMPANY

Station Bond No. Badge No.

Employed as

Nationality Age Height Weight

Married or Single General Appearance

Introduced by Turned in by

Appointed by

Superintendent.

*** CASH DEPOSIT.**

Date 190

This is to certify that there has been deposited with the Treasurer the sum of $ as a forfeit as provided for in this application.

Treasurer.

Received 190 of Blank Railway Company; the sum of $ being refund of above deposit.

* Eliminate or Retain

Report of Committee on Standard Blanks and Forms—Obverse and Reverse of Surgeon's Certificate of Examination.

J. E. Duffy, Syracuse, then presented the report of the committee on "Standard Application Blanks and Forms," which comprised printed copies of the two blanks recommended.

It was decided to accept the report and act as to its adoption at a later session.

The secretary presented the report of the committee on "Collection and Compilation of Mechanical Costs," comprising three blanks, designed to show an analysis of maintenance costs for certain portions of car equipment (accounts Nos. 6, 7, 20 and 21) the desirability of which for comparative purposes had been determined upon at the Schenectady meeting of the association. It was the idea of the committee that the subdivisions of each of these four accounts, as entered on the blanks submitted, would not comprise the labor cost of removing a defective part from the car and that of placing a new part. Few roads keep records from which the labor cost of this nature can be found easily. It is to be noted that the total of each account is to show the cost of this labor, however, and will be greater than the sum of the several items in the account.

The three bases of comparison are car-miles, wheel-miles and motor-miles. It is intended that the most appropriate one of these be used, or all three of them where the nature of the part permits. The records as kept by members of the association heretofore were not on a uniform basis or in common terms admitting of ready comparison; this condition the blanks reported were designed to remedy. Inquiry developed that most of those present believed that data called for on the blanks could be obtained easily.

On motion of Mr. T. W. Wilson, Buffalo, the report was accepted and the committee continued with instructions to keep in communication with the companies using the report forms and report at the next quarterly meeting.

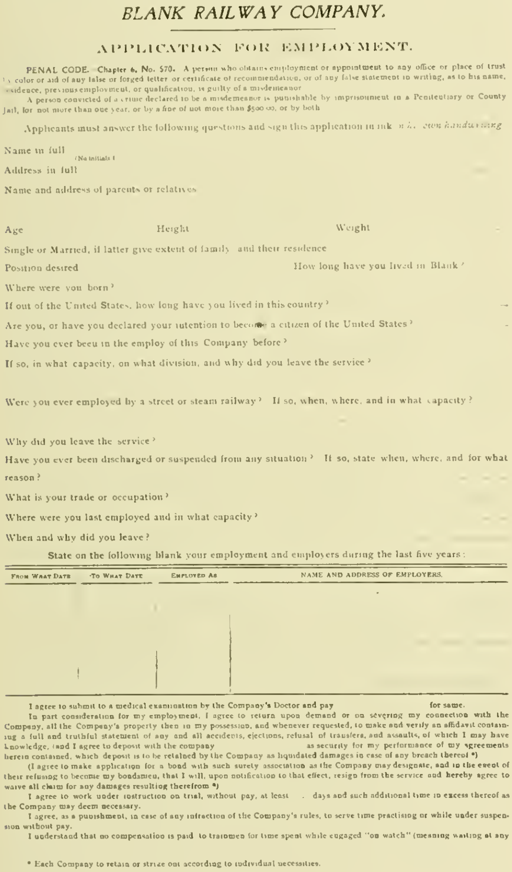
On motion of Mr. J. H. Pardee, Canandaigua, the committee was instructed to prepare a note to be added to the blanks giving more detailed instructions as to their use.

A reproduction of a portion of one of these blanks is given herewith for the purpose of showing the arrangement.

Account No. 6 covers axles, brakeshoes, journal bearings, painting, car signs, wheels—(cast) grinding, wheels (steel) turning, damaged cars, car body repairs (except painting and damaged).

Account 7 covers armatures, field coils, commutators, brushes, brush holders, armature bearings, motor axle bearings, total motor repairs (this item to include all labor and material to repairs and installation), controllers, gears, pinions, trolley wheels.

Accounts 20 and 21 cover labor car cleaning, material car cleaning, car inspection (including minor repairs in car house), lubrication. On the same blank provision is made for the entry of the following items: Total car miles during period, total car hours during period, average 18-hour cars, average maximum number cars in daily service, number cars ready for service, number defective cars "pulled in" during period.



BLANK RAILWAY COMPANY.

APPLICATION FOR EMPLOYMENT.

PENAL CODE. Chapter 6, No. 570. A person who obtains employment or appointment to any office or place of trust by color or aid of any false or forged letter or certificate of recommendation, or of any false statement in writing, as to his name, residence, previous employment, or qualification, is guilty of a misdemeanor.

A person convicted of a crime declared to be a misdemeanor is punishable by imprisonment in a Penitentiary or County Jail, for not more than one year, or by a fine of not more than $500.00, or by both.

Applicants must answer the following questions and sign this application in ink *in his own handwriting.*

Name in full (No initials)

Address in full

Name and address of parents or relatives

Age Height Weight

Single or Married, if latter give extent of family and their residence

Position desired How long have you lived in Blank?

Where were you born?

If out of the United States, how long have you lived in this country?

Are you, or have you declared your intention to become a citizen of the United States?

Have you ever been in the employ of this Company before?

If so, in what capacity, on what division, and why did you leave the service?

Were you ever employed by a street or steam railway? If so, when, where, and in what capacity?

Why did you leave the service?

Have you ever been discharged or suspended from any situation? If so, state when, where, and for what reason?

What is your trade or occupation?

Where were you last employed and in what capacity?

When and why did you leave?

State on the following blank your employment and employers during the last five years:

FROM WHAT DATE	TO WHAT DATE	EMPLOYED AS	NAME AND ADDRESS OF EMPLOYERS.

I agree to submit to a medical examination by the Company's Doctor and pay for same.

In part consideration for my employment, I agree to return upon demand or on severing my connection with the Company, all the Company's property then in my possession, and whenever requested, to make and verify an affidavit containing a full and truthful statement of any and all accidents, ejections, refusal of transfers, and assaults, of which I may have knowledge, (and I agree to deposit with the company as security for my performance of my agreements herein contained, which deposit is to be retained by the Company as liquidated damages in case of any breach thereof.*)

(I agree to make application for a bond with such surety association as the Company may designate, and in the event of their refusing to become my bondsmen, that I will, upon notification to that effect, resign from the service and hereby agree to waive all claim for any damages resulting therefrom.*)

I agree to work under instruction on trial, without pay, at least days and such additional time in excess thereof as the Company may deem necessary.

I agree, as a punishment, in case of any infraction of the Company's rules, to serve time practising or while under suspension without pay.

I understand that no compensation is paid to trainmen for time spent while engaged "on watch" (meaning waiting at any

* Each Company to retain or strike out according to individual necessities.

Report of Committee on Standard Blanks and Forms—Application Blank.

Mr. J. H. Pardee, Canandaigua, presented the report of the committee on "Interchangeable Coupon Tickets," which is given elsewhere.

Discussion of this report was on motion deferred until a later session.

Mr. E. S. Fassett, Albany, reported that the committee on "Rules" had nothing to submit at this time, but might present a report at a later session.

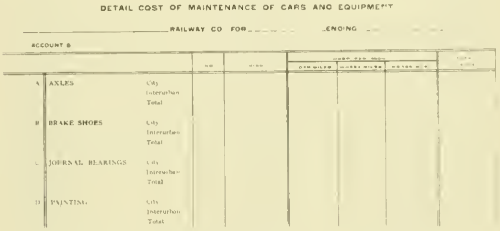
The secretary read the report of the committee on "Revision of Constitution and By-Laws" recommending that there be three classes of membership as follows:

1. Active members, comprising electric railways operated wholly or in part in the state of New York.

2. Associate members, comprising individuals, firms or corporations closely identified with the electric railway industry, other persons whose experience had been such as would make, in the opinion of the executive committee, their affiliation with the assocation desirable. This class is designed to include engineers, bankers and brokers, and electric railways in nearby states and in Canada. This class to have privilege of the floor, but no votes, and to pay dues of $25 a year.

3. Allied members, comprising individuals, firms and corporations engaged in manufacturing, selling or dealing in electric railway supplies. This class to have neither privileges of the floor nor votes, but to be entitled to send representatives to the annual meetings (but not quarterly meetings); this class to pay dues of $15 per annum, payable as a registration fee at the time of the annual meeting, which dues include one banquet ticket.

Mr. W. W. Cole, Elmira, called attention to the importance of having the co-operation of engineers, bankers and manufacturers, now that the association is engaged to some extent in recommending and adopting standards, since these interests would be affected by the action of the association in such matters.



DETAIL COST OF MAINTENANCE OF CARS AND EQUIPMENT

RAILWAY CO FOR ENDING

ACCOUNT 8

			[illegible]	[illegible]	[illegible]			[illegible]
					[illegible]	[illegible]	[illegible]	
A	AXLES	City						
		Interurban						
		Total						
B	BRAKE SHOES	City						
		Interurban						
		Total						
C	JOURNAL BEARINGS	City						
		Interurban						
		Total						
D	PAINTING	City						
		Interurban						
		Total						

Collection and Compilation of Mechanical Costs—Heading of Suggested Blank.

Mr. Albert H. Stanley, Newark, as a representative of a prospective associate member, endorsed the proposed change, and urged the importance of having as associate members the railway companies in neighboring states so that there might be greater harmony in matters of practice.

The report was adopted as read.

Tuesday Afternoon Session.

The second session was called to order at 2:30 p. m. and papers on the "Sale of Power" read by Messrs. S. B. Storer, Charles E. Parsons, and G. A. Harvey, who discussed the questions from different standpoints, that of manufacturer, the middleman, and the consumer. These papers are published elsewhere in this issue.

In the discussion of this subject attention was drawn to the fact that Mr. Harvey, representing the purchaser of power, used the maximum 2-minute peak in his computations of rate, while Mr. Storer on behalf of the seller used the 1-minute peak. Mr. Storer's position on this matter was that it made no difference what peak time was taken. If based on a 2-minute peak the probability of the loads of different users interfering with each other would be greater, and the power company could not "over-sell" its capacity to so great an extent as when basing its figures on a 1-minute peak; and, therefore, the power company would have to charge a higher rate for power based on a 2-minute peak than on a 1-minute peak.

Mr. Storer considered it better for a power user to pay for the short-time high peak (which might be for only one day per month) where it did occur than to have a lower maximum limit and suffer delay when circuit breakers opened because that lower maximum was exceeded. Purchasers of power who are also sellers could "over-sell" their surplus on the same basis as the power company "over-sold" its capacity and none would suffer since all figured on the same basis.

Mr. C. Loomis Allen, Utica, commented upon the importance of the subject, since railways are spending about 17 per cent of their earnings for the single item of power. Two things had to be considered when discussing water power as compared with steam—the cost and quality of service. His company has bought power under three different plans. The first plan, which was unsatisfactory, provided for payment on the horsepower-year basis; 75 per cent of the estimated maximum to be at one price and the excess at a higher rate. The second plan, which was even more unsatisfactory, was on the kilowatt-hour basis; this doubled the total cost of power. The company's present contract is on a kilowatt-hour basis with a guaranteed minimum: the power company maintains a steam reserve ready to supply power on 30 minutes notice, and also stipulates to pay a penalty if power fails for a greater length of time than 30 minutes; this contract is satisfactory.

Mr. W. W. Cole, Elmira, called attention to the cost of having men in readiness to operate steam reserve plants, a cost that continued even though the plant was not operated, and in reply Mr. Harvey stated that in his computations he did not have to consider this point as his upper limit for hydro-electric power was the 15-hour line which meant two shifts of men for the steam plant and but little idle time.

Messrs. Cole and Pardee spoke of the expense attached to the "readiness to serve" element of the steam reserve plant, Mr. Pardee saying that this element he had found in one case to be 80 per cent of the cost of the steam reserve plant.

Mr. A. H. Stanley, Newark, suggested that the principle discussed in the papers presented might well be applied to that of an electric light company supplying power to a railway company and cited a case where while both companies had the same board of directors the lighting manager refused to give the railway manager a low rate on power although the railway load greatly improved the lighting plant load-factor.

Wednesday's Session.

The convention was called to order at 10:30 a. m. and Mr. D. F. Carver, of Rochester, presented a paper on "Car Inspection," an abstract of which appears elsewhere.

Mr. Carver added that the company could not make similar trip inspections on other lines because of local conditions. On its interurban line to Sodus Bay, a distance of 40 miles, 18-ton cars equipped with four G. E. 67 motors ran on limited service in summer, making the 77-mile round trip on the high-speed section in 3½ hours; these cars are inspected at the car house in the city and the inspector is held responsible for mechanical failures that prevent the car from making a round trip. The trip inspection is supplemental to the regular overhauling which should be made after the car has made a certain mileage. On the city line mentioned in his paper the reduction in the number of crippled cars as a result of trip inspection meant increased reliability in service; it prevented men from reporting cars for trivial causes which did not affect the fitness of the car for operation.

Mr. Danforth, Rochester, called attention to the fact that if the location of shops was such as to require disabled cars to be hauled any considerable distance, the cost of hauling cars improperly reported as disabled could be saved by trip inspection, and the net cost of the trip inspection be reduced greatly thereby. Trip inspection enabled more of the inspection work and car cleaning as well to be done by day, which is a great advantage since night labor is notoriously inefficient. Also with inspectors at the end of the line the cars were started on the return trip on time.

Mr. Pardee, Canandaigua, described the method of his company in inspecting and cleaning cars each trip, at a point where interurban cars had a wait of 40 minutes. There are two men at the station who make the inspection, clean the outside of the car and wipe the windows; the conductor sweeps the inside of the car and dusts the seats; the motorman inspects and wipes the controllers. A part of the cleaner's work is to remove the cuspidors from smoking compartments and substitute clean ones; the ones taken out are cleaned and placed in the next car.

Mr. Stanley, Newark, stated that his company, appreciating the need of giving the public clean cars, and not being able to provide modern car houses as promptly as needed, had built small houses, holding two cars, where cars were cleaned and washed. He asked about the vacuum system of cleaning.

Mr. Cole, Elmira, stated that his company would adopt the vacuum system of car cleaning, which had the advantages of celerity (12 minutes per car) and removal of dust and dirt without dispersing it.

After the close of the discussion on Mr. Carver's paper, Mr. Charles R. Barnes, engineer for the New York Railroad Commissioners, made a short address complimenting the association upon its work. He stated that when possible it would be the policy of the commissioners to refer complaints to the association for investigation. Complaints had been made to the commission about the height of car steps; those complaining had been advised that the association would be asked to take up the matter, which he now submitted as a proper subject.

On motion the chair was instructed to appoint a committee of three to report at the next quarterly meeting as to the height of steps for urban and interurban cars. This committee will be appointed by the incoming president.

On motion a committee consisting of Messrs. Allen, Wilson and Root, was appointed to draft resolutions expressing appreciation of the services of the association of Mr. B. B. Nostrand, Jr., who this year ceased to be an active member of the association. Mr. Nostrand will continue as an associate member.

The committee on "Interchangeable Coupon Tickets" was continued with instruction to write at once to all interurban companies asking for assent to, or discussion of, the form of contract submitted in its report.

The nominating committee presented the following as officers for the ensuing year:

President, J. N. Shannahan, Gloversville.
First vice-president, T. W. Wilson, Buffalo.
Second vice-president, E. S. Fassett, Albany.
Secretary, C. B. Fairchild, Jr., New York.
Treasurer, H. M. Beardsley, Elmira.
Executive committee: Oren Root, Jr., New York; W. H. Pouch, Newburgh; C. D. Beebee, Syracuse; C. G. Reel, Kingston.

The nominees were elected unanimously, and the meeting adjourned.

Entertainment at New York State Meeting.

Besides the banquet the purely social features of the entertainments comprised a carriage drive in and about Saratoga for the ladies on Tuesday afternoon, a trolley ride to Lake George on Wednesday morning, where luncheon was served at the Hotel Worden, and a dancing party at the Grand Union Wednesday evening.

The banquet, which was most happily described as "A Lawyer's Paradise—The Twenty-fourth Annual Gathering of the New York State Negligence Case Defendants," was on Tuesday evening. The speakers were Hon. Edgar T. Brackett, of Saratoga; J. M. Wakeman, of New York, and Thomas R. Kneil, of Saratoga.

Two inspection trips were also included in the program. Wednesday afternoon a party of about 45 visited the Spier Falls generating station of the Hudson River Electric Power Company, leaving Saratoga at 1:35 in a special car furnished by courtesy of the Hudson Valley Railway Company. From Ashland Crossing on the railway line to the power plant, a distance of about 7 miles, the party was taken in carriages under escort of officials of the power company.

Thursday morning a party of 35 visited Schenectady at the invitation of the General Electric Company and the American Locomotive Company. Leaving Saratoga at 9:50 on the Delaware & Hudson, the party was met at Ballston Spa by a special car of the Schenectady Railway Company, furnished by courtesy of the general manager, E. F. Peck, who accompanied the party. After a visit of inspection to the plant of the American Locomotive Company, luncheon was served by the General Electric Company in the gymnasium of its new central fire department station. After luncheon the visitors were taken through those departments of the plant that are of greatest interest to railway men, including the new power house, the wire and cable building,' the turbine building, the transformer building, the induction motor building, the machine shop and the railway motor shop.

The registration showed that there were present at the convention 63 delegates from railway companies, two representatives of the state board of railroad commissioners, and 79 representatives of manufacturers, supply houses and the technical press. The ladies present, of whom there were a large number, were not registered.

Exhibits.

The following manufacturers were represented by exhibits at the New York State Convention:

Rail Joint Company, New York. Sample rail joints were shown.

Crouse-Hinds Company, Syracuse, N. Y. Headlights and harpoon guy anchors.

Allis Chalmers Company, Milwaukee, Wis. Sample blades of the Allis-Chalmers steam turbine.

Franklin Car-Heating Company, Syracuse, N. Y. Sample hot water car heater. K. D. Hequembourg, general manager.

Gould Storage Battery Company, New York. Exhibit consisted of sections of the company's different batteries.

National Brake Company, Buffalo, N. Y. Sample of the Peacock Brake which is said to be in use on 450 electric lines.

National Lock Washer Company, Newark, N. J. Exhibit of cam fixtures, balance fixtures, sash balances, sash locks and lock washers. F. B. Archibald and D. Hoyt.

G. F. Taylor, Randolph, Mass. Exhibited a new car fender with an auxiliary appliance for setting the air brakes when it is tripped, which is claimed to be very simple in operation.

T. H. Symington Company, Baltimore, Md. Samples of Baltimore ball bearings, centre and side bearings, which are being extensively used on both steam and electric equipment. Carll Tucker.

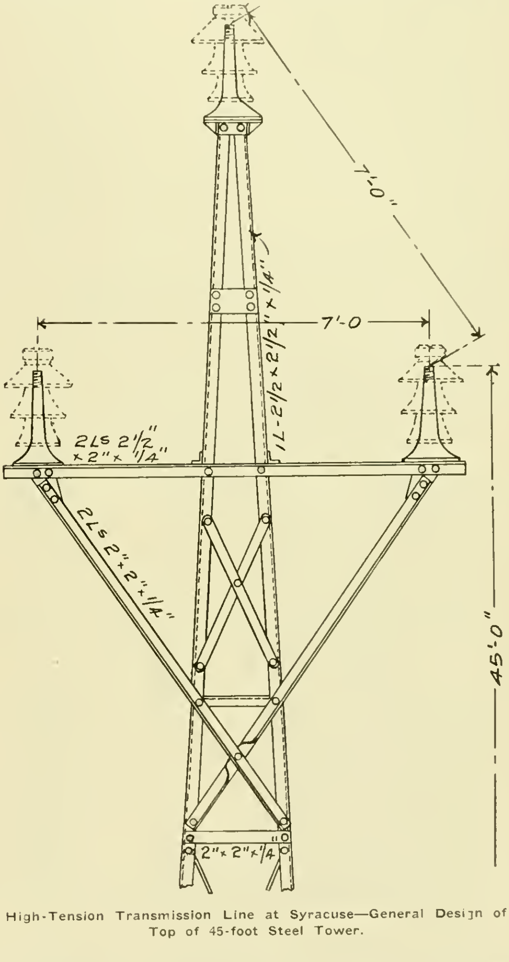
Dossert & Co., Incorporated, New York. Exhibit of a large variety of solderless connections and terminals for wires and cables, also lugs and taps. H. B. Logan, president, and H. B. Dossert, vice-president.

Atha Steel Casting Company, Newark, N. J. Two samples of the "Titan" steel motor gears were exhibited, one which had been tested for 20,000 miles on a car of the Interborough Rapid Transit Company without showing wear, and another which had been used for three months on a car of the Public Service Corporation of New Jersey. Louis A. Shepard, secretary.

HIGH-TENSION TRANSMISSION LINE AT SYRACUSE, N. Y.

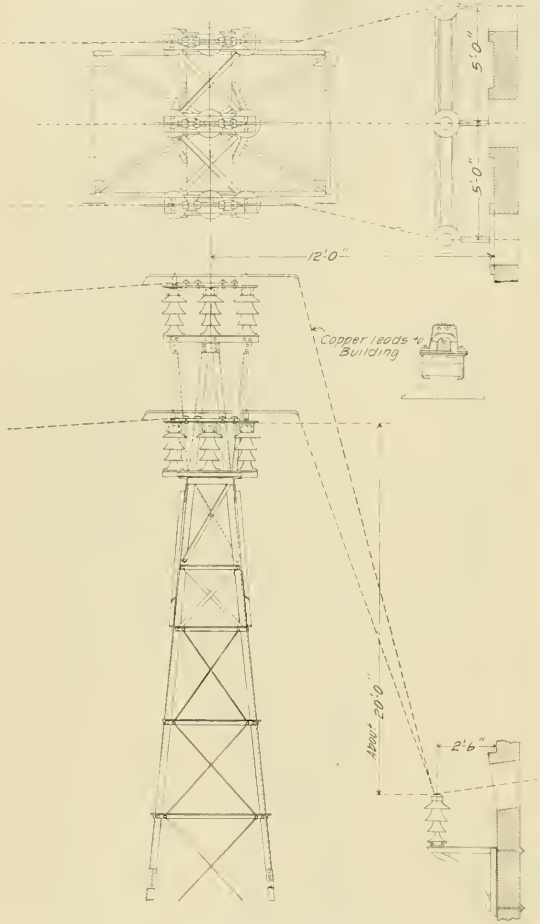
There has been completed recently in Syracuse, N. Y., a high-potential electric power transmission line which is interesting not only as forming part of a 175-mile line from Niagara Falls to Syracuse, on which the initial potential is to be 60,000 volts, 3-phase, but because of the careful design and the precautions taken to avoid accidents.

The Syracuse Rapid Transit Railway Company is to receive 5,000 horsepower over this line, measured at the substation, which will be used to supplement its power generating plant in Syracuse. At this time the transmission company—the Niagara Lockport & Ontario Power Company—has a single 3-phase line to Syracuse ending at the city limits where connection is made with the railway company's transmission line. Later, when a second long-distance line is built, it will tap the Syracuse section at a point within the city limits. The loss in transmission is placed at about 8 per cent. and the substation in Syracuse is designed, therefore, for 55,000 volts on the incoming line.



High-Tension Transmission Line at Syracuse—General Design of Top of 45-foot Steel Tower.

The section of the transmission line within the city limits was built by the Archbold-Brady Company of Syracuse for the Syracuse Rapid Transit Railway Company. Work on this was begun on May 5, last, and the line was completed early in July. This section is 10,888 feet long, and is carried on 40 steel towers. The longest span is 400 feet and the shortest ones 15 feet; these short spans were necessary on account of sharp curves at crossings of the canal and railroads.

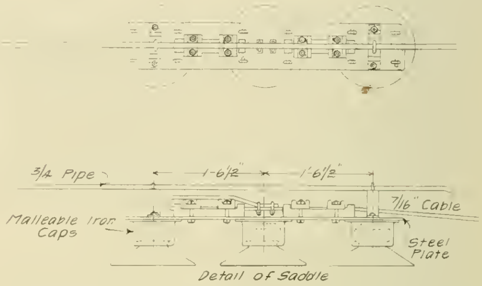


High-Tension Transmission Line at Syracuse—Details of Strain Tower and Equalizing Saddle.

The conductors for this portion of the line are of 7-16-inch plow steel cables, 7 strands, this material being chosen because of its high tensile strength, a breaking stress of 25,000 pounds per cable. Its conductivity is ample for the small current needed at the potential to be used. Each cable is in a single piece, tied to the insulators with annealed wire. The insulators are of the type made by R. Thomas & Sons for 60,000-volt service, and to stand a test at 150,000 volts. This insulator is made in three parts, joined and fastened to the pin by cement. The diameter of the top petticoat is 15 inches, and when mounted the top is 25 inches above the base of the pin. The pins are of malleable iron fastened to the tower by four ⅝-inch bolts. The pin and insulator together weigh 75 pounds. The three cables are at the vertices of an equilateral triangle 7 feet on a side.

The total curvature of the line in Syracuse is 196 degrees. At curves the tension at which the cables are strung is reduced to about 500 pounds in order to decrease the side pull; on tangents the normal tension is adjusted to 800 pounds per cable.

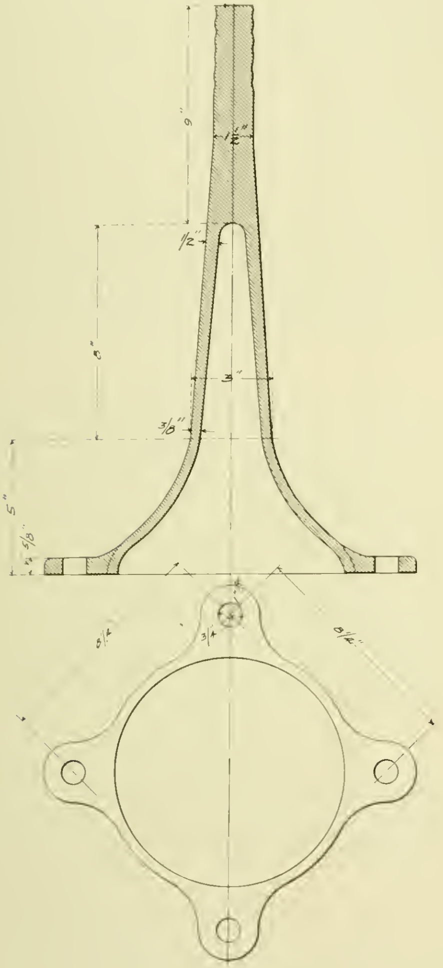
At the dead-end towers there are three insulators for each cable and the method adopted to secure a proper distribution of the stress among the three insulators is an interesting detail. Each insulator has fitted over it a malleable iron cap, and the caps are bolted to a steel plate provided with slotted holes, so that initial stresses on the insulators are avoided, and the three insulators made to form parts of a single unit. The cable is clamped to a cast iron saddle bolted to the top of the plate mentioned. On towers where the angle in the line is more than 7 degrees and two or more insulators are used for each cable a similar arrangement



High-Tension Transmission Line at Syracuse—View of 45-foot Narrow Base Tower.

of caps, plate and saddle is used to insure equal division of the stress on the insulators.

The towers vary in height as required to get the desired clearance over buildings and other wire structures; besides the two dead-end towers which are 48 feet high, there are 18 of 45 feet, 11 of 51 feet, 6 of 57 feet, and 3 of 63 feet in height. The design in general is shown in the line drawing; the angles are 2½x2½x¼ inches for the 45-foot towers and 3½x3½x5-16 inches for the upright members of the base panels of the taller towers. The tower height in each case is from the ground to the top of the bottom insulators; from the bottom of the foundation to the top of the top insulator would be about 11 feet more, making the 63-foot tower 74 feet over all.



High-Tension Transmission Line at Syracuse—Details of Insulator Pin.

In the design of the towers the assumed wind load was taken as 1¼ pounds per lineal foot of cable based on ¼ inch of sleet and a wind pressure of 30 pounds per foot on a flat surface or 15 pounds on a round surface. The dead-end towers were designed also to provide for endwise strains under maximum wind and sleet loads, and calculating these strains, a sag not to exceed one-twentieth of the span was allowed. The minimum sag allowed was 1 foot in 40. The heights of towers are arranged to give ample clearance over buildings and other wires, and protecting cradles are provided where other wires are crossed. The towers at the angles are designed to care for side strains due to the tension in the cables based on the sags stated and also for the pressure of the wind on the cable and on the tower. Enough insulators are placed at the angle towers so that the maximum angle made by the cable on any one insulator is 7 degrees; in most cases it is less than 5 degrees. The towers at angles and dead-ends are stiff structures designed to take the greatest assumed stresses. The wind pressure on the tower itself was assumed at 60 pounds per panel on each half of the tower.

The maximum pull allowable on a single cross-arm tower is 1,000 pounds for each cable, the ties being designed to break at this tension. Bolted joints in the main members of towers are designed on the basis of 10,000 pounds shearing per square inch and 20,000 pounds bearing per square inch.

The tower foundations are of reinforced concrete. For the 45-foot and 51-foot towers there are no piers, but for each corner of the structure there is an angle 3x3x5-16 inches extending into the ground 5 feet and at the lower end riveted to a base made up of two angles 2 feet long joined by lattice bars. Below ground the upright angle is protected by a circular sleeve of concrete 6 inches in diameter. The riveted bases for the two legs on one side of the tower form part of the reinforcement of a concrete slab about 3x8 feet and 12 inches thick which is further strengthened by eight ½-inch round rods running longitudinally. The foundations were set to an accurate templet and the towers, which had been assembled in the shop, were raised to place and bolted to the foundation angles.

For the taller line towers and the two dead-end towers concrete piers were placed at each corner. These piers are each about 5 feet deep and 3x5 feet at the bottom and are reinforced with two 1-inch rods to which the tower leg is anchored. Piers for the 63-foot towers are 9 feet between centres.

As a precaution against accidental contact with the towers, each one is surrounded by a tight board fence 8 feet high. Each tower is grounded by means of No. 00 copper wire soldered to a copper plate 18x36 inches which is buried in a bed of coke at a depth of 5 feet.

In the route of the transmission line through the city but three streets are crossed. The line, however, crosses the New York Central tracks twice, the Delaware Lackawanna & Western twice and the West Shore Railroad once, most of these crossings being at acute angles. At these five railroad and the three street crossings guard cradles are to be erected under the high-tension wires and 6 feet below them. The guard cradle consists of ¾-inch galvanized pipes spaced 4 feet apart and clamped to five cables of 7-16-inch plow steel. The pipes are placed at right angles to the power cables, and are bent upwards at the ends, making a coarse mesh basket 24 feet wide and 2 feet deep. The longest cradle is that at the West Shore track, and is 150 feet long.

In the Simplon tunnel it has so far been found impossible to employ electric locomotives for hauling trains. The engineers were at first puzzled, says the New York Herald, but have discovered that the metal surface chilled to ordinary outdoor temperature, immediately upon entering the warm, moist atmosphere of the tunnel received so great a volume of condensation that the insulation of the entire organism was affected and short circuits occurred. The motors are now undergoing hurried alterations to obviate this difficulty. In the meantime satisfactory service is afforded by steam locomotives, provided with a new type of smoke consumer.

INTERCHANGEABLE COUPON TICKETS.*

PROPOSED FORM OF CONTRACT COVERING INTERCHANGEABLE COUPON TICKETS.

Whereas, certain of the electric railways of the state of New York, doing a general interurban business, are desirous of forming an association for the purpose of issuing interchangeable coupon books, and

Whereas, it is desired that said interchangeable coupon books shall be good for transportation upon all the lines that are parties to this agreement,

Therefore, it is hereby covenanted and agreed by and between the respective electric railways signing this agreement that the following rules and regulations be and are hereby adopted and agreed to as the rules and regulations governing said roads in issuing said interchangeable coupon books, and providing for the method of redeeming the same and the settlement of balances between said roads, to-wit:

In consideration of the adoption by all parties of this contract of the uniform interchangeable coupon book, we, as authorized representatives of our respective railways, do hereby agree to abide by the following rules for the regulation of the use of said interchangeable coupon books, and for the settlement of the revenue arising therefrom.

Article 1.

The coupon books shall be uniform in every respect, differing only in the name or initials of the various railways by which they are issued, and shall be known as Form N. Y. S. R. A. No. 1.

Article 2.

A committee of three, called the transportation committee, shall have charge of the details of the issuance of the interchangeable books provided for in this contract, and the settlement of all questions arising thereunder as may be hereinafter provided for. This committee shall be appointed by the parties to this agreement, and such committee shall elect a chairman. The members of this committee shall continue as such members until the expiration of one year from the date of their appointment, and until their successors shall be appointed.

Article 3.

The books and necessary accounting forms shall be procured only from an official printer by requisition made upon the chairman of the transportation committee, who will order the shipment made and the bill rendered direct to the railway from which the requisition may have been received, which requisition shall not be honored by the chairman until the fifteenth of each month covering the following thirty days' supply, requisition to state numbers on books unsold, and number of books sold since previous requisition. The books will number consecutively for the entire association, that all books may bear different numbers without regard to the source of issue. Not more than three books per month per mile of single track or terminal mileage to be ordered by any one company.

Article 4.

These coupon books, when regularly issued, shall be honored for passage over all the railways, parties to this contract, upon the conditions of the contract under which they are sold, and it is agreed that the contracts under which said respective roads sell said interchangeable coupon books, shall be identical in form, and the observance of this provision as to making said contract under which said books are sold, shall constitute a vital part of this contract.

Article 5.

The settlements of the revenue derived from the sale of the coupon books shall be made as follows:

A. All foreign coupons collected by companies, party to this contract, shall be mailed to the company whose initials or number are stamped on each coupon, not later than the fifth of the calendar month following the month in which honored. A statement shall be rendered for the coupons so sent, on a basis of 83 1-3 per cent of their face value, and a remittance for such statement, if found correct, shall be made by the issuing railway not later than the tenth of the same month, provided settlement between two companies, each of which has mailed a statement to the other for the same month, shall be made by the payment of the balance.

B. The failure on the part of any company to make settlement with all other companies by the tenth day of each month, shall be made known at once to the chairman of the transportation committee by written notice, briefly stating the facts.

That the chairman of the transportation committee, on receipt of such a notice, shall promptly notify all other companies, party to this contract, of the facts by written notice served by registered mail, and that after the receipt of such notice from the chairman, the amount due each month from each company to said defaulting company or companies, shall be remitted to the chairman of the transportation committee instead of to the defaulting company or companies. Accompanying such remittance shall be rendered a copy of the bill or statement, together with the coupons collected, which statement shall show the amount due the sending company from the defaulting company, and the chairman shall be authorized to take such steps as are found necessary for the collection on behalf of the companies so sending him their accounts, the balances, if any, due them from the defaulting company.

C. When a company has once defaulted on its settlements, the chairman shall refuse to honor requisitions from said company for any more interchangeable coupon books, unless, at a meeting of the officials representing the roads parties to this contract, at which meeting not less than three-fourths of all the companies parties hereto are in attendance, action be taken on the affirmative vote of not less than three-fourths of the companies represented, authorizing the chairman of the transportation committee to supply the defaulting company or companies with coupon books at not to exceed the maximum rate per month provided for in said contract.

Article 6.

Each company shall keep a daily record of the serial numbers of each company's coupons collected, which record shall be the basis of settlement in case of loss of coupons in transmission, provided copy of record is furnished by collecting railway, who shall, however, indemnify the issuing railway against the possibility of the lost coupons again being presented for payment.

Article 7.

Expired or unused coupon books must be redeemed only by the railway by which issued, if presented within eighteen months of date of sale, but only on the following basis: Full fare or face value shall be computed for all the coupons which have been used, and the remainder of the original cost shall be the proper redemption value.

Example.—A book is returned for redemption containing sixty coupons, showing that 180 coupons have been used, redemption value shall be computed as follows:

Original cost of book (240) coupons..........	$10.00
Coupons used, 180 at 5 cents each.............	9.00
Redemption value of unused coupons......	$ 1.00

Article 8.

Additional companies may become parties to the use of the interchangeable coupon books on approval of the transportation committee, and by subscribing to and complying with the terms of this contract. Such additions shall be bulletined by the chairman of the transportation committee.

Article 9.

These rules and such regulations as may be adopted thereunder shall bind all companies, parties thereto, from the time they respectively become parties hereto as provided in Article 8 hereof. Any company may withdraw therefrom by giving sixty days' notice to the chairman of the transportation committee, provided it has adjusted all balance due or accruing to the companies, parties to this contract. Further, that notice of withdrawal shall begin with and run from the first day of the calendar month. The chairman of the transportation committee will bulletin the name of the company desiring to withdraw from this agreement with the advice that the withdrawal shall be effective on a certain date, after which date the name of the company withdrawn must have been erased from all new books sold. The company withdrawing must return to the chairman of the transportation committee all unsold interchangeable coupon books, the numbers of which shall be shown on the above mentioned bulletin. The company withdrawing shall continue to honor for passage all books which may have been sold prior to the bulletined date of withdrawal, up to the date of the expiration of each coupon according to the contract. date of sale.

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*Report presented at the annual meeting of the New York Street Railway Association, Saratoga Springs, N. Y., June, 1906, by a committee consisting of J. H. Pardee, George G. Blakeslee and R. P. Stevens.

Article 10.

Any violation of this agreement shall be promptly reported to the chairman of the transportation committee, and by him brought before a meeting of the committee, and will be acted upon by such committee or referred to the meeting of the parties of this agreement for further action, called for action thereunder.

Article 11.

These articles and the rules of this contract may be amended only by a two-thirds vote of the companies subscribing, provided ten days' notice of the proposed changes has been given all members, through the office of the chairman of the transportation committee.

Article 12.

The expense of the maintenance of this contract and the interchange of coupon books hereunder shall be adjusted and paid semi-annually by the constituent parties hereto, on the basis of the number of miles of main line of interurban railway operated by the respective companies outside of municipal limits. Each company shall pay such proportion of said expenses as the main line of such company operated outside of the municipal limits, shall bear to the total number of miles of main line of all the companies, parties hereto, operated hereunder, and the term "main line" shall be understood to mean a single track between given points, exclusive of side-tracks, turn-outs or sidings, said expense not to exceed $25 per annum per company without the consent of the majority as provided in this contract.

Article 13.

It is mutually agreed by the parties to this contract that the individuals signing this agreement as representatives of all respective railways, parties to this contract, shall each constitute a special trustee to hold, and as such trustee to become responsible for all moneys held by their respective roads for the purpose of paying for the coupons redeemed for such companies, or other roads parties to this contract. That is, the said officials shall each respectively become the trustee for all funds received by their said road, under the terms and conditions of this agreement, and shall hold said moneys as trust funds for the use of said roads entitled to same under the terms of this contract.

Article 14.

Each copy of this contract shall be considered as an original, and when any company signs such copy, such signing shall be considered as the signing of the original contract jointly with all constituent companies, whether such companies are then, or thereafter become parties hereto.

Article 15.

The transportation committee shall construe the articles and rules and issue such general bulletins to the companies, parties to this agreement, as occasion may demand. The decision of the transportation committee shall be final in all matters of dispute arising from the interchange of tickets.

This agreement, and the foregoing rules and regulations as they may exist, or as hereafter amended under Article 11 hereof, shall continue in full force and effect and be binding on each constituent company, parties hereto, from the date any such company becomes a party hereto as herein provided, to the time of withdrawal of such company herefrom as provided in Article 9 hereof, and it shall not be necessary at any time hereafter to renew this agreement between the parties hereto.

By the foregoing agreement, rules and regulations, and by the terms and conditions of the contract printed in the interchangeable coupon book, we as authorized representatives of our respective railways, agree to be bound.

....

....

Dated at ....
this ....day of ....190...

Conditions to Be Attached to Interchangeable Coupon Tickets.

1. The holder of this interchangeable coupon book is entitled to receive an aggregate of $12 worth of transportation over the several lines of electric railway named on the cover of this book, or which may be hereafter bulletined, which transportation will be given at rates of fare, and under the local regulations of the respective lines so named in the bulletin and subject to all the terms and conditions of this contract.

2. In selling this interchangeable coupon book over the line of any other company, the selling company acts as agent only, and assumes no responsibility beyond its own line.

3. The coupons contained in this book shall not be honored for transportation if detached by any person other than the conductor, or if the serial number on left side of each coupon is altered, or in case of the number on outside cover of book not agreeing with contract number, which is the number of each coupon, and if for any reason the conductor demands the surrender of this book and the payment of full fare, then said book shall then be surrendered to the conductor, who shall issue his receipt therefor, and application for rebate on account of such surrender shall be made to the company from which the book was originally purchased. No attempt shall be made by the purchaser to adjust any such differences with the conductor.

4. The conductor will detach, in the presence of the passenger, a sufficient number of coupons at their face value to cover the local cash fare on his train, or the local one-way ticket fare if same is lower than local cash fare.

5. The interchangeable coupon book does not permit the checking of baggage thereon under any terms or conditions differing from the rules of the road over which said book is being used, and under no circumstances shall the liability of any company permitting the checking of baggage on this book be greater than the sum of fifty dollars ($50) in case of loss or damage to any such baggage.

6. This interchangeable coupon book expires one (1) year from the date of purchase. Expired or unused coupon books may be redeemed only by the railway by which it is issued, if presented within eighteen months of date of sale, but only on the following basis:

Full fare or face value shall be computed for all coupons which have been used, and the remainder of the original purchase cost shall be the proper redemption value.

7. It is understood and agreed that not less than two (2) five-cent (5c) coupons will, under the contract conditions governing the use of this interchangeable coupon book, be accepted for any distance, no matter how short.

8. The further stipulations and conditions printed on the cover of this interchangeable coupon book constitute and form a part of this contract.

9. Any persons using this ticket shall be bound by all the conditions and provisions of this contract, as fully as the original purchaser of same.

10. I have read all of the conditions of the above contract, and I hereby accept the same.

....

Fireproof Steel Building Construction.

A fireproofing material possessing all the essential properties has been discovered. If the steel skeleton is covered with metal lathing, strong wire cloth or expanded metal lathing, heavily plastered inside and covered with stucco on the outside, roof and all, using an asbetic or other equally good fireproofing material, mixed with quick lime on the inside and Portland cement on the outside, it will be safely protected from corrosion and heat and the stucco will be as hard and durable as stone. In case the plaster and stucco are shattered (which can hardly occur, as they are strongly reinforced by the steel lathing) and knocked off by heavy strains or shocks, the steel frame will not be injured nor will life be destroyed by the fall of the small fragments. In the light of these facts it would seem to be very much out of place to load the steel structure with the enormous weight of a heavy and clumsy integument of brick, concrete or stone which adds but little strength, only great weight, and thus making the building weaker instead of stronger, not safe but more dangerous, less impervious to heat or cold and far more costly both in foundation and superstructure. —William Sooy Smith, Western Society of Engineers.

Master Mechanic Tracey of the St. Louis & Suburban Railway, St. Louis, Mo., has devised an oil-cup for motor bearings which has a novel valve for regulating the flow of oil. Connected to the valve is a wire to the end of which is attached a brass weight. This weight extends down into the cone of the oil-cup. When the car is in operation its motion causes the weight to oscillate, thus tilting the valve and allowing the oil to work through in sufficient quantities for efficient lubrication.

NEW CAR HOUSE AND TRUCK SHOP OF THE INTERNATIONAL RAILWAY COMPANY, BUFFALO, N. Y.

The International Railway Company of Buffalo, N. Y., recently has completed a new car house which embodies the results of long and careful consideration on the part of the management. Mr. T. W. Wilson, formerly the chief engineer and now the general manager of the company, has given much study to car house design for the last four years, and the structure here described in the important features of heating, lighting, ventilation and convenience of arrangement is unsurpassed. The details of the design were worked out by Mr. Thomas Pumfray, of the engineering department, who has acted as architect and construction engineer. The building was constructed by contract, but the installation of tracks, lighting system, etc., was done under direction of the heads of the several departments of the railway company.

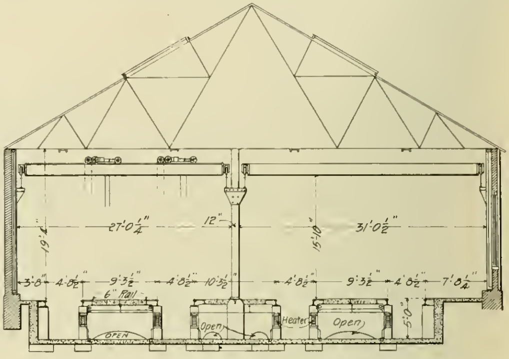
The car house is built along the north side of the company's Cold Springs property, extending the entire length of the lot, except that space has been left at the front (west) end for the location of a building to be used for car house offices and employes' rooms.

The building is 108 feet wide, 521 feet long at the north wall, and 600 feet long at the south wall, the front wall running at an acute angle so that at the front of the building there is enclosed a triangle in which is comprised all the special work giving access to the street that in car houses of the usual design would be in front of the house or perhaps in the street itself. The location of the special work within the building obviates a vast amount of track cleaning when there is snow, as a single track gives egress at the front end, and it also greatly simplifies the overhead lines; these are more conveniently supported inside the car house and are more cheaply maintained, and besides an unsightly network is removed from the street.

New Car House and Truck Shop at Buffalo—Entrance to Car House.

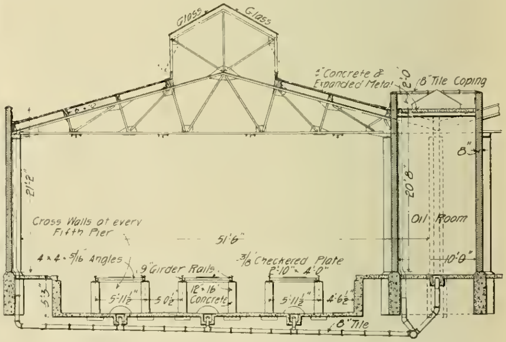
The side walls are of brick, with piers 21 inches thick and 24 inches long, spaced 16 feet between centers for support of the roof trusses, and connected by curtain walls 8 inches thick. This construction was adopted because while of ample strength it was much cheaper than structural steel supporting columns would have been. The house is divided longitudinally into two equal sections by a wall, similar to the side walls, which extends to within about 35 feet of the front of the building. In section both portions are similar, and are as shown in the accompanying engraving. The roof is of 2-inch hemlock planks laid on yellow pine purlines and covered with "Actinolite" and felt roofing. In the center is a skylight 16 feet wide with glass in both top and sides, and having the side sash pivoted, and operated by means of rods mounted on the side walls. At the front, over the special work, the roof is flat. The east end of the house is closed by six Kinnear rolling steel doors; at the front there is only a single similar door.

Each section of the building is divided transversely by two sets of Kinnear doors placed 14 feet apart; the passageway thus formed is to be closed at the south wall by a Kinnear door. This arrangement provides means for cutting off one-half of the length of the building in event of fire and at the same time would give access to the burning portion through this side opening and permit firemen to work to advantage. The longitudinal middle wall and the two sets of transverse doors enable each quarter of the house to be isolated in event of fire. The gable ends at the rear and at the fire doors are of expanded metal and cement plastered.



New Car House and Truck Shop at Buffalo—Arrangement of Pits in Truck Shop.

The east or rear portion of the car house is designed for inspection and cleaning; this portion, between the rear doors and the fire doors near the center of the building, is 257 feet long, and has four tracks in each section, making eight tracks for this end of the car house.



New Car House and Truck Shop at Buffalo—Arrangement of Inspection House.

The inspection pits are 200 feet long; the pit excavation extends the entire width of the car house and is floored with concrete. The tracks are supported on piers of reinforced concrete spaced 8 feet between centers longitudinally. Each pier is 12 x 16 inches, reinforced with a ½-inch twisted rod near each corner. At the top is a wrought-iron plate, 12 x 16½ inches, on which the rail rests. The rail is fastened by clips and bolts anchored in the pier, as shown in the detailed drawing of the pier. The rails are of 9-inch semi-groove section.

The space between the two rails of one track is entirely open. Between adjacent tracks the rails are connected by 4 x 4 x 5 16-inch angles spaced 4 feet between centers. These angles hold the rails to gauge and also serve as supports for the floor which consists of Carnegie rolled checker plates 4 feet long and 3 feet wide, bolted to the cross angles.

New Car House and Truck Shop at Buffalo—Method of Reinforcing Piers.

On each pier just below the rails are mounted two 16-candlepower incandescent lamps, facing the pit, thus providing an abundance of light under the cars. The wiring for these pier lights is run in ¾-inch iron conduits built into the piers and laid under the basement floor; these lights are, of course, placed five in series and operated by railway current. The necessary junction boxes, which are of cast iron with brass covers and rubber gaskets, are located in the pit floor. At five points in each pit there are iron plug boxes placed on the rear of the piers for attaching portable clusters of five lights which are used for inspection under the car.

New Car House and Truck Shop at Buffalo—Inspection Pits in Car House.

On each pit pier there are also two Colonial wall radiators, 23 x 13¼ x 2¾ inches, 7 square feet of radiating surface, made by the American Radiator Company. By this means the heat is supplied immediately under the cars where it is most effective in melting ice and evaporating water on the trucks, getting them in shape for inspection or repairs in the least possible time.

In each pit there are provided a number of ¾ inch water taps for service use; these are on a main entirely separate from that provided for fire purposes.

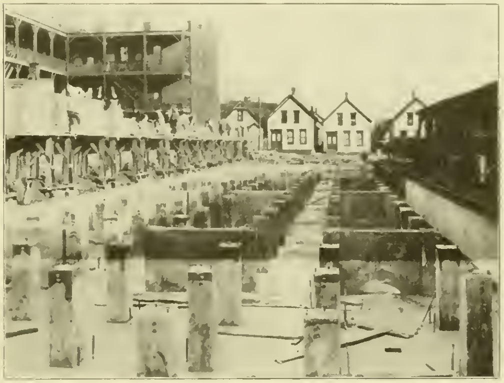
To facilitate handling motors the inspection sections of the house have a number of pit jacks known as the Watson-Stillman telescope hydraulic motor lifts; an overhead hoist for convenience in lifting heavy parts out of the pits is installed also.

For the car house men there are Merritt steel lockers with expanded steel fronts.

Storage rooms, one for oil and one for other supplies are located between the two sections of the inspection portion of the building.

The front two sections of the car house are intended for storage of cars after inspection and before going into service. In each side of the building there are five tracks, laid 10 feet between centers, making a total of 10 tracks in the front portion of the car house. This portion is floored with cinder concrete flush with the tops of the rails, which are of 4-inch T section.

In both inspection and storage sections the general lighting is by 50-candlepower incandescent lamps hung with "conlets" on the lower chords of the roof trusses. These lamps are placed on the trusses so as to have a light above the space between each pair of tracks and between the side tracks and the walls, making six lights per truss in each half of the front section and five lights per truss in each half of the rear section of the building.



New Car House and Truck Shop at Buffalo—Piers for Inspection Pits.

For fire protection a 4-inch high-pressure line connected to the city main is laid with four standpipes into each of the four sections of the car house; at each standpipe is a rack with 50 feet of 2-inch hose. Hand fire extinguishers are also provided.

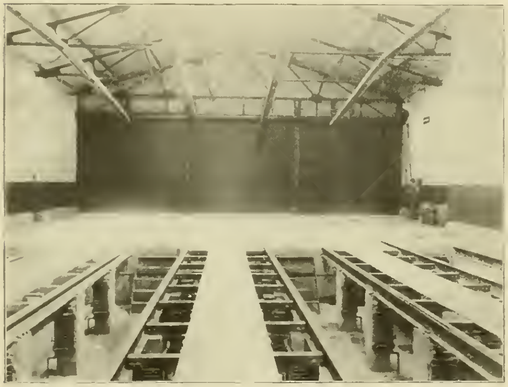
The rolling steel doors which close all the wall openings of the building (there are no windows except at the front), are operated by electric motors. A 3-horsepower CQ-3 General Electric motor is mounted on the wall convenient to the doors, and this drives a sprocket wheel connected to the door sprocket by a Jeffrey No. 150 chain. The sprocket is loose on the shaft and is thrown into gear by a friction clutch after the motor is up to speed in the desired direction. Where there is more than one door, separate clutches are provided, and the doors may be raised one at a time or together. The motors being operated infrequently and then only for a short time, they are completely enclosed. The front door can be raised or lowered in 12 seconds or less. At the rear end and in the middle where there are three doors in a set they can be raised simultaneously in 12 or 15 seconds, but the section posts have to be raised, which requires a little time additional.

South of the car house are five storage tracks extending the entire length of the property. In operation cars enter the yard, over two other parallel tracks, pass to the east end of the lot and thence enter the car house from the rear. After inspection and cleaning, cars are moved west to the storage sections of the house.

Truck Shop.

A portion of the old car house, which was vacated upon the completion of the new building just described, has been refitted for a truck shop, the changes including new floor construction to provide pits, the installation of cranes, and placing skylights in the roof. This work was all done by the railway company. The building thus used is 248 feet long by 60 feet 6 inches wide inside. There are four tracks; for three of these are pits 186 feet long, and for the fourth a pit 156 feet long.

The piers supporting the track rails are similar to those in the car house, but the cap plates are extended down the rear sides and have riveted to them brackets to support old 9-inch rails used to carry the floor between tracks. The longitudinal members of the floor system are old 6-inch rails placed 12 inches from the track rail on each side and a 6-inch I-beam midway between them. On these rails and beams the floor, consisting of 6 inches of concrete reinforced with expanded metal, is carried. The 12-inch spaces between the track rails and the concrete floor adjacent are covered by movable Carnegie checker plates.



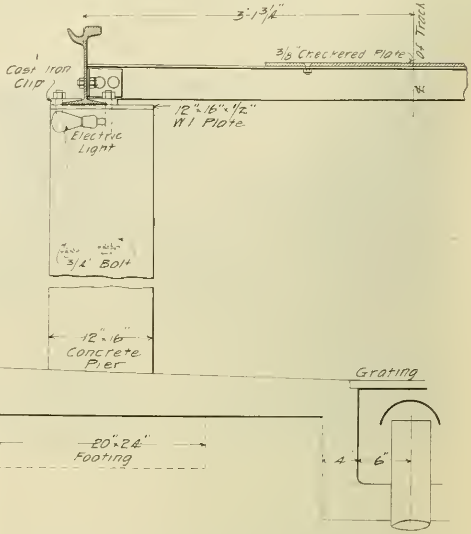
New Car House and Truck Shop at Buffalo—Rolling Steel Doors at Centre of Building.

To support crane ways, brackets were placed on the steel columns in the side walls of the building and a third row of columns (built up of two 10-inch channels and two 12x⅜-inch plates) placed on 15½-feet centers near the center of the building.

This gives crane spans of 25 feet 8 inches and 29 feet 8 inches, respectively. On each side are two Northern Electric Company's cranes with two 5-ton hoists on each crane. By means of these, car bodies can be conveniently lifted from the trucks and shifted about the shop.

Jib cranes of about 12 feet radius and fitted with air hoists having 8-inch cylinders will be placed on alternate centre columns.

In this shop, as in the car house, the trolley wires are hung in wooden troughs on the underside of the roof trusses, but over one track two wires are placed in the trough; one serves as the source of power for both cars and cranes, and the other is the return circuit for the cranes. This ingenious arrangement removes the crane power wires from the walls.

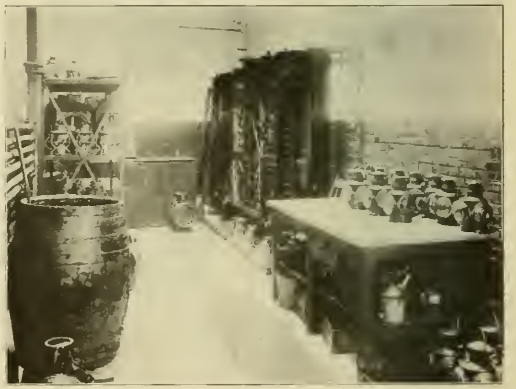


New Car House and Truck Shop at Buffalo—Floor Details, Inspection Shop.

The arrangements for lighting and heating the pits are similar to those in the car house, but the steam return pipes are placed in trenches with movable cover plates to facilitate access to them in event of trouble.

Kinnear doors are placed at both ends of the shop.

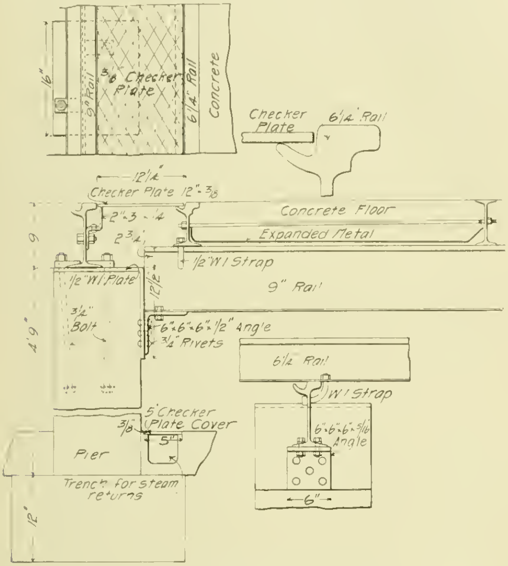
At the east end of the truck shop is a transfer table 36 feet long, designed to handle the longest cars operated by the company. This was built by the company. The construction will be understood by reference to the drawing. In order to keep the depth of the table small, the members of the frame are made up of two 7-inch channels riveted to a



New Car House and Truck Shop at Buffalo—Oil and Lantern Room.

heavy web-plate 7 inches deep. In the cross members the web-plate is 1 inch thick and in the longitudinal members, ¾ inch thick; on the latter are placed steel bars 1x3 inches, forming a running rail similar to the tram rail in section.

The trolley supplying current to the transfer table is a rolled T-section mounted in a conduit built in the floor near one of the transverse rails, as shown in the drawings of the transfer table. Half of the cover for this conduit is hinged to permit convenient inspection.



New Car House and Truck Shop at Buffalo—Details of Floor in Truck Shop.

General Subway Plans for Chicago.

Mr. Bion J. Arnold, consulting electrical engineer, who was requested, on May 31, by the local transportation committee of the Chicago city council to prepare a report of his recommendations as to the action to be taken in order to secure through-routing of cars and the adoption of a universal transfer system, on July 2 submitted a report in which he advised against installing an underground trolley conduit system, and urged the construction of a 2-level subway loop in the congested district. In regard to the question of underground conduit versus overhead construction, he said that if the system were installed only in the downtown district the annoyance caused by the change from overhead to underground trolley at some point outside the congested district would be so great that the additional benefits would not justify the additional cost, and that the cost of installing the underground system throughout the city would be prohibitive. Other objections to the immediate construction of the underground system in the business district are the necessity of sewer reconstruction in that district, the possible installation of a high-pressure water system, and the probability of the construction of a subway, as in either of these events the conduits would have to be removed.

With regard to subway construction, Mr. Arnold said that in his opinion all cars which pass through the river tunnels should be kept underground in the business districts and that as it is necessary at once to lower the river tunnels, he could see no reason why a beginning should not be made in the direction of the development of a subway system. To take care of the west side traffic through the tunnels, he advised the construction of a low-level single-track subway loop passing around the district now bounded by the elevated loop. This single-loop tunnel would be connected on Market street by a single-track low-level tunnel between Washington and Van Buren streets.

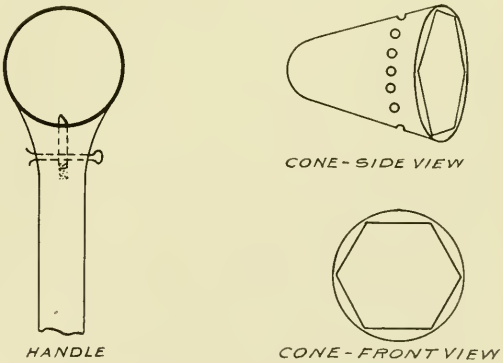
To take care of the north side traffic which would pass through the reconstructed La Salle street tunnel there should be a low-level double-track subway extending from the La Salle street tunnel south on La Salle street, gradually rising to Randolph street, where it would become a high-level subway; thence east on Randolph street to Clark street where the tracks would divide and serve the middle of the "loop" district. This arrangement would permit a double-track subway route between the north and south sides of the city, as well as provide for subway loops for all traffic coming through the river tunnels from the north and west sides. All of these subways when constructed would be susceptible of future development.

Mr. Arnold said that this arrangement would offer no grade crossings; provide for a comprehensive downtown distributing system, and permit the universal use of transfers without injustice to anyone; and the construction of portions of the system would permit the immediate adoption of through routes between the north and south sides and loops for the north and west and south side systems. The cost of such a subway is estimated at $4,800,000.

A Useful Ratchet Wrench.

The accompanying illustrations show a ratchet wrench which is said to have proven very useful in car repair work. This tool was invented by A. P. Bischman, barn foreman of the Chicago & Joliet Electric Railway Company, at Joliet, Ill., and is designed for removing nuts from the bolts of split gears. It may, however, be used to advantage on many square or hexagonal nuts which, by reason of their inconvenient location, are not readily reached with an ordinary wrench.

As is shown, the wrench is composed of a handle and a cone-shaped device which takes the place of the jaws in the usual form of wrench. The handle has a circular opening at the end into which the cone fits. A small steel pin inserted in the handle and held in place by a split key, serves as a ratchet and engages with small indentations in the surface of the cone. The interior of the cone is hollowed to the form of a hexagonal pyramid, thus enabling the wrench to fit a majority of the nuts more generally used. The wrench will work either right or left handed depending on which side of the opening in the handle the cone is inserted. It is said that this wrench can be made for about 75 cents.



Details of Useful Ratchet Wrench.

THE SALE AND MEASUREMENT OF ELECTRIC POWER.*

BY S. B. STORER, GENERAL MANAGER NIAGARA LOCKPORT & ONTARIO POWER COMPANY.

Since the day when the first commercial electric light entered the field of artificial illuminants, there have been endeavors to find an equitable way of charging for energy supplied in the form of electricity. At first, in the absence of any measuring instruments, the flat rate was the only method. This was soon found to be impractical for most cases, and the ampere-hour meter, followed by various types of integrating and recording wattmeters, soon brought into use the idea of paying for the exact amount of energy used, at a given price per ampere-hour or per kilowatt-hour. This method is still in very general use in its simplest form, but there has been dissatisfaction with it from the time it started. The fact of the matter is that neither the straight flat rate nor the straight kilowatt-hour rate is equitable except when applied in connection with a definite load-factor—and even then it may not be entirely so, due to uncertainty as to the number of hours per day that full-load conditions prevail, with corresponding high efficiency, and to the hours during which operation continues at light loads with resultant low efficiency.

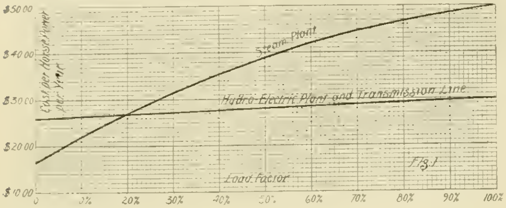


Figure 1.—Showing Method of Plotting Costs Per Horsepower Per Year in Terms of Load-Factor and Price Per Horsepower Per Year.

It is fully recognized now, however, that the load-factor is the root of the trouble, and unless a system of charging gives due consideration to it there will always be inequality of rates and dissatisfaction on the part of the power company or of its customers, or of both. This has been shown in all classes of service,—incandescent and arc lighting, heating and power purposes, including railway lines,—and in power companies and consumers of all sizes.

Nor are power companies the only ones so affected by the load-factor. No manufacturing company is entirely successful in the ordinary sense of the word unless it keeps all of its tools and equipment in use all of the time. No railroad can earn its full quota until it finds its tracks carrying their maximum number of trains every 24 hours and every train carrying fully loaded cars throughout. Robbed of unnecessary verbiage, it means that on every investment the interest, tax, insurance and depreciation charge—commonly referred to as the fixed charge—continues at a uniform rate over 24 hours of every day in the year, and unless the apparatus or material representing that investment is put to its maximum use every hour in the day and every day in the year, there is an opportunity for increase in efficiency until the theoretically possible condition of maximum use is reached. And the ratio of the use actually obtained to that theoretical or possible maximum use is the load-factor of the manufacturing establishment and of the railway line just as it is of the power house or transmission system.

Before taking up the question of rate-making and methods of charging, brief reference will be made to the cost of production of power from hydro-electric plants and from steam plants. In the former the cost is almost solely one of fixed charge, while in the latter it is made up from fixed charge coupled with variable items of coal, water, oil, waste and incidentals. With the hydro-electric plant, consequently, the cost per horsepower per year is almost constant, regardless of whether supplied one hour per day or 24 hours per day. Repairs are about the only variable, and they may be considered as increasing in direct proportion to the load-factor. Labor, oil, waste, etc., are nearly the same irrespective of the proportion of light loads to full load.

With the steam plant, on the contrary, the items of coal, labor, etc., increase rapidly with the load-factor, and hence the cost per horsepower per year increases in almost the same proportion. The costs per horsepower per year may be shown graphically, as in Figure 1, the curves being plotted in terms of load-factor and price per horsepower per year.

The curve marked "Hydro-Electric" is intended to represent cost of power after transmission for some distance, while that marked "Steam Plant" represents cost at the power-house switchboard. These curves are about the best obtainable from any power houses of 5,000 to 10,000 horsepower capacity with coal from $2.50 to $2.75 per ton.

In Figure 2 the same costs are shown, but plotted in terms of load-factor and price per kilowatt-hour. Particular notice should be given to the wide variation in cost per kilowatt-hour, it ranging in the steam plant from 9 cents at a load-factor of 4 per cent to about three-quarters of a cent at 100 per cent load-factor. The hydro-electric plant varies under the same range of load-factors, from 10 cents to less than half a cent per kilowatt-hour.

In Figure 3 is given a very convenient and easy method of changing cost per horsepower per year at various load-factors to equivalent cost per kilowatt-hour or vice-versa. The method to be followed in making the change is self evident, so no explanation of it is needed.

If we now take up the case of a hydro-electric plant and transmission system with a wholesale cost of $30 per horsepower per year, and attempt to make a flat rate to all consumers, we quickly find there is little demand for power, as nearly every consumer has an intermittent load, or, in other words, a low load-factor, and cannot afford to pay or will not pay the price it is necessary to ask for flat-rate 24-hour power. It then becomes incumbent on the power company to devise a system of charging that will not only

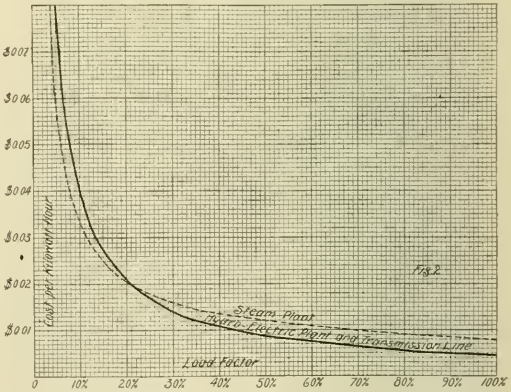


Figure 2.—Showing Method of Plotting Costs Per Horsepower Per Year in Terms of Load-Factor and Price Per Kilowatt-Hour..

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*Paper presented at the annual meeting of the New York Street Railway Association, Saratoga Springs, N. Y., June, 1906.

enable it to market its output but to do so at prices that will secure a net revenue for the power equal to $30 per horsepower-year, besides an additional amount sufficient to cover the cost of retaining or distributing it, but to further enable it to sell at rates low enough to be attractive to consumers. It is believed that the method described hereinafter offers a solution that is equitable to both power company and consumer, and at the same time gives the ordinary small consumer a low rate per horsepower per year in spite of heavy distributing cost, and also gives the power company the necessary return on its maximum demand output.

In the proposed system everything is sold on a maximum demand basis, with the rate per horsepower per year varying between fixed limits in accordance with the consumer's load-factor. In order that this method may be clearly understood, mention is here made of the fact that the load-factor is computed on the basis of a 24-hour day; the kilowatt-hour consumption per day, divided by 24, being taken as the average demand, and dividing this average demand by the maximum demand for that day, we have a fraction —or in one case unity—representing the load-factor for the given 24-hour period. In the same way the load-factor for any month may be obtained by dividing the average rate of consumption for the entire month by the average of the daily maximum demands, thus obtaining the average load-factor of all the days in the month.

The maximum demand is taken as being the highest rate of consumption for any one minute during the day; or, as it is perhaps more commonly expressed, the highest 1-minute peak occurring during any day is considered as the maximum demand for that day. The average of these highest daily 1-minute peaks occurring during any month then becomes the average maximum demand for that month and is so used in the calculation of load-factor.

Assuming that a manufacturer has made a contract to buy 400 horsepower for the operation of his factory, and that the rate per horsepower-year varies between the limits of $16 and $43, depending on the load-factor, the determination of his rate per horsepower per year for any given month would be as follows:

If the kilowatt hours consumed during a 30-day month are 43,200, then the average demand for power is 43,200 divided by 720 (the number of hours in the month), equal to 60 kilowatts or 80 horsepower. Assuming further that his maximum demand each day was just 400 horsepower, then, of course, his average maximum demand for the month will be the same amount, and the load-factor is 80 divided by 400 = .2, or, as commonly expressed, 20 per cent.

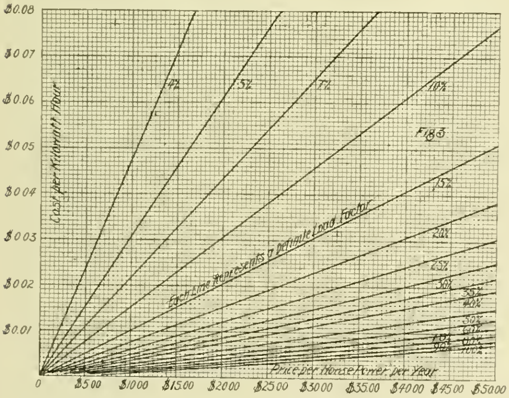

Figure 3.—Showing Method of Changing Cost Per Horsepower Per Year at Various Load-Factors to Equivalent Cost Per Kilowatt-Hour and Vice-Versa.

If the rate per horsepower-year varies between $16 and $43, it will be evident that the variable quantity is the difference between $16 and $43, or $27. The rate is therefore equal to the minimum rate ($16) plus the load-factor (.2) times the variable ($27). Two-tenths of $27 is $5.40, so the rate per horsepower per year for the month will be $16 plus $5.40 equals $21.40. The total charge for the month would therefore be 400 times $21.40 divided by 12, or $713.33. This is equal to 1.65 cents per kilowatt-hour. If his use of the power had been such as to give a load-factor of 30 per cent, the rate per horsepower per year would have increased to $24.10, but the equivalent cost per kilowatt-hour would have decreased to 1.24 cents—a reduction of almost 25 per cent in cost per kilowatt-hour due to increasing the load-factor to 30 per cent

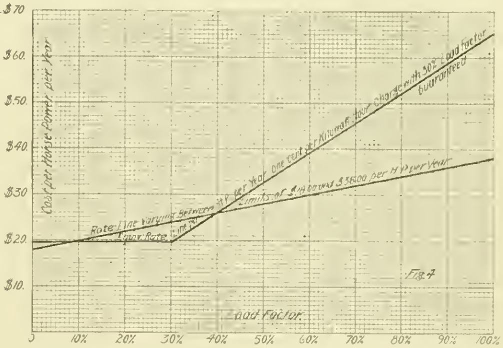

Figure 4.—Chart Illustrating Suggested Plan of Charging For Electric Power.

This may readily be put in the form of an equation which, if the desired rate per horsepower per year is R

the minimum rate limit is A

the maximum rate limit is B

and the load-factor is L

is expressed by $R = A + L (B-A)$.

This method is much more equitable than that sometimes used, of selling all the power on a kilowatt-hour basis with a guarantee from the consumer of a specified load-factor. By referring to Figure 4, there will be seen the diagrammatic equivalent of such a method of charging converted into a cost per horsepower per year basis. The example given there is that of a kilowatt-hour cost of 1 cent with a guaranteed load-factor of 30 per cent. This simply means that the consumer pays a flat rate per horsepower per year of $19.60 at all points from zero load-factor to 30 per cent load-factor inclusive, and from 30 per cent to 100 per cent load-factor the rate increases in direct proportion until it reaches the limit at $65.35 per horse-power per year at 100 per cent load-factor.

This method is bad for both parties to a contract. For the power company, if we assume that any considerable transmission is involved, and that a relatively large amount of power is under contract to be delivered, the price of $19.60 per horsepower per year is too low to cover cost—much less than necessary to pay a profit. There is also no probability that the rate will ever be much higher than this, as there is no inducement to the consumer to increase his load-factor above the guaranteed 30 per cent.

On the other side, the consumer has a right to assume that the price at the guaranteed load-factor offers a fair return per horsepower per year to the power company, and consequently no effort is made to increase his load-factor, particularly as his cost per kilowatt-hour remains the same. If however, the contract is one of long duration and, due to natural causes beyond control of the consumer, the load-factor should increase to a high value, say 75 or 80 per cent, the consumer would be paying over $50 per horsepower per year for power that he is justified in thinking does not cost over $20 or $25.

A better way of charging—certainly a much more equitable way—would be to sell the power on a maximum-demand basis with the rate varying between the limits of say $18 and $38 per horsepower-year,—this rate-line also being shown in Figure 4. With this way of charging there is a continual inducement held out to the consumer to increase his load-factor. The power company would probably also increase its profits somewhat by the increase in load-factor, but only to a comparatively small extent.

In Figure 5, the two curves of load-factor and cost per kilowatt-hour are given, and they indicate more clearly than words the advantage of the system having as its basis the load-factor of the consumer. The dotted line represents the one cent per kilowatt-hour rate with a guaranteed revenue equal to that from a 30-per-cent load-factor consumption; the full line or curve gives the equivalent cost per kilowatt-hour of the variable $18 to $38 per horsepower-per-year rate.

With such a system of charging established, the question immediately arising will be as to the manner in which the limiting values per horsepower per year are established, with power companies of different capacities to supply demands of all kinds and sizes.

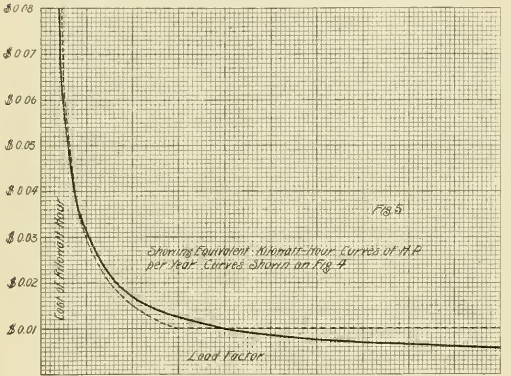

Figure 5.—Showing Equivalent Kilowatt-Hour Curves of Horsepower-Per-Year Curves Shown in Figure 4.

Referring to the assumed case of a hydro-electric plant and transmission line wherein the wholesale cost is $30 per horsepower per year, and further assuming that the rated capacity of the system as a whole is 10,000 horsepower, we then have a basis with which to start. In Figure 6, a vertical line is drawn from the zero point at the middle of the lower line, and laid off in price per horsepower per year. On the lower line to the left is laid off the amounts of power that may be sold, up to the capacity of the plant. To the right are laid off the load-factors that may be obtained by the various consumers. From the $30 point on the vertical line a horizontal line is drawn to the left that may be known as the "base-rate line."

If power is to be furnished to consumers having a load-factor of approximately 100 per cent and sold on a straight flat rate per horsepower per year, then the cost of retailing the power in small amounts will increase the cost as the amounts decrease, approximately in accordance with the curve starting from the base-rate line on the 4,400-horsepower point, and increasing to $43 on the zero-horsepower line. If the consumer takes anything over 4,400 horsepower, he may be considered as being entitled to the wholesale rate of $30 per horsepower per year.

If, however, the consumers operate at a low load-factor, the power company may "oversell" its plant to an extent directly dependent on the relation between the capacity of its plant and the amount of firm power sold to each one. The amount it may be oversold may be determined approximately from the equation of the "Law of Probability," or graphically from the "Probability Curve," both of which may be found in books on higher mathematics, but which will not be taken up here, as this is not intended to be a treatise on that subject.

It may be said, however, that if a large number of motors are operating in a city, performing all classes of work, starting and stopping, running part of the time at full load and part of the time at light loads, the ordinary amount of power required to supply them will be much less than the total rated capacity of the motors, and still every one of the motors may at some time during the day have been operating at full rated load. As a matter of actual practice the ratio is about three to one, the motors, of course, being mostly of from ¼-horsepower to 20 or 30-horsepower. The 10,000-horsepower plant could therefore safely connect on its circuits small motors having a total rated capacity of 30,000 horsepower. The average load-factor of the different installations would not be much, if any, over 15 per cent, and where occasional large installations are operating somewhat more uniformly, the load-factor would reach perhaps 25 per cent, it being assumed, of course, that they are practically all 10-hour factories. To such factories, of say 400-horsepower capacity, the power house could not be oversold more than twice. If the entire output were sold to one, two or even three large consumers, the plant could not be oversold at all, as the chance of both or all three of the consumers taking their maximum of power at the same time is so high as to become almost a certainty. With a single 10,000-horsepower consumer there is no "chance" about it, and such a customer must pay the full flat rate of $30 per horsepower per year regardless of load-factor.

In Figure 6 the curve marked "maximum rate line" is an approximation of the "probability curve," drawn with reference to the $30 base-rate line and the central vertical line. The curve marked "minimum rate line" is also an approximation of the "probability curve," drawn with reference to the same line but on the lower side of the $30 base-rate line.

The minimum rate or the zero load-factor rate for any amount of power may now be found by following the vertical line from the desired amount of power indicated by the figures at the bottom line of the diagram until it intersects the minimum rate line. From the point of intersection follow the horizontal line to the right of the vertical line at the middle of the sheet, thereby obtaining the amount in dollars per horsepower per year. In the same way, from the intersection of the vertical line indicating the horsepower with the maximum rate line, the amount of the maximum rate per horsepower per year is obtained.

Taking as an example a 400-horsepower consumer, the intersections are found to be at —a— and —b— on the minimum and maximum rate lines, corresponding to $16 and $43, respectively. Carrying a horizontal line to the right from —b— to —b'— on the 100-per-cent vertical load-factor line, and connecting —a'— and —b'—, we then have a variable rate line for 400-horsepower consumers. The rate for consumers desiring to buy on a straight flat rate regardless of load-factor is obtained from the point —m— where the 400-horsepower line crosses the flat-rate line, or at the $36 point.

In the same way a 3,200-horsepower consumer's variable rate would be from $24 to $34, with a corresponding flat rate of $30.40, and the variable rate line runs from point —c'— to —d'—.

Referring to the small consumers having a load-factor of approximately 15 per cent, and following the same method given above, ascertaining that the variable rate is from $11 to $52,—at 15 per cent load-factor the rate would be $11.+.15 ($52.—$11.)=$17.15.

In view of over-selling three times for this class of consumers, the gross income derived for each horsepower actually delivered from the plant would be three times $17.15, equaling $51.45, or practically the maximum rate. This increased return per horsepower output of the station, over the corresponding straight flat-rate price of $41 per horsepower year, is made necessary by the fact that three installations must be made to get the gross revenue of $51.45, while only one is required for the $41 revenue. The difference in revenue is therefore just about sufficient to make up for this additional expense.

In the same way the 400-horsepower consumer with a load-factor of 25 per cent would pay at the rate of $22.75 per horsepower per year, and over-selling twice would bring in a gross revenue of $45.50 per horsepower per year.

The combination of these two rate-curves, both approaching the $30 base-rate line as the firm power increases, taken in conjunction with the method of charging that depends on the load-factor of the consumer, furnishes a system that affords absolute protection to the power company and at the same time gives all consumers every benefit of low price that can be done with safety to the vested interests of the power company. Each consumer would pay a rate per horsepower per year such as to give the power company a uniform percentage of profit on all its business, so there could be no question as to "preferential rates" and certain consumers having advantages over others.

It may be said that the maximum demand is hard to measure, but with a demand for that class of meters there will come an instrument capable of fulfilling the requirements. For the most part, in small installations, the maximum demand may be taken as the rated capacity of apparatus installed, and an ordinary integrating wattmeter giving the kilowatt-hour consumption per month, for use in determining the load-factor, is all that will be required. With large installations, where greater accuracy is required, more money may be spent on individual measuring instruments with no relative increase in cost of meters over that of the many small consumers, and the total error in records would probably be very much less than under present service.

In the sale of power on the maximum-demand basis, the question of the amount of firm power to be taken, and the permissible demands above that amount, are always the subject of much discussion. In this system, however, the intermittent demands in excess of the firm power may be permitted in percentages approximately those obtained by following about the same curve as the maximum rate curve—measurement being made from the $30 base line up to the curve. For example, the small consumer may be permitted to take power 100 per cent above his firm amount; the 2,000-horsepower consumer, allowing for probable maximums occurring at the same time, would be entitled to about 25 per cent intermittent demand. At the 10,000-horsepower limit, no intermittent demands could be permitted, as there is nothing with which to furnish them.

It must be understood, of course, that all permissible intermittent demands are paid for at the same rate per horsepower per year as the firm power, and are to be measured by the highest, daily, 1-minute peaks, or average 1-minute demands in excess of the firm power. The 1-minute peak is taken for the reason that any load lasting for a full minute means a definite and corresponding opening of the gates controlling the waterwheels, and therefore limits their output as much as if it lasted a much longer time.

It is not to be expected that this system of charging—based as it is on the "Law of Probability"—will apply where only one class of service is supplied, as, for example, incandescent lighting. There is very little "probability" about that service, for people want the light when it is dark and the demand consequently comes at that time. Where, however, lighting is only one of many other uses for power, the system indicated above applies with equal force and may be used for every consumer, regardless of size or of the use to which the electric energy is put, and also of the number of hours per day it is supplied.

The same system may also be applied to steam plants if consideration is given to the range in cost due to change in load-factor. The modification would appear in Figure 6 by using two base-rate lines, one at about $20 and the other one at about $55. The minimum and maximum rate curves would then be drawn with reference to these two lines, leaving a considerable variation in price per horsepower per year between zero and 100 per cent load-factor even for the largest consumers. Greater leeway as to permissible intermittent demands could also be given, due to steam engines being capable of temporary overloads to a much greater extent than are waterwheels. The general principles underlying all power plants of whatever type are, however, the same; and one system of sale and measurement of their output, giving due consideration to local conditions, would, if universally used, do much to establish a better relationship between producer and consumer—if, as in the one proposed, it is founded on equity.

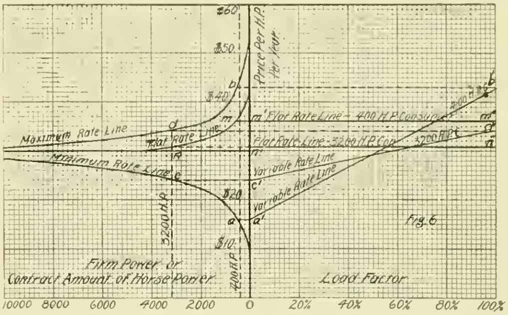

Figure 6.—Chart Illustrating Results Under Suggested Plan for Charging for Electric Power.

Egyptian Purchases of Railroad Supplies.

According to Lord Cromer's report the contracts for the supply of material, exclusive of fuel, to the Egyptian state railways during the past year were distributed as follows: Great Britain, $2,190,000; Belgium, $1,048,000; Germany, $420,000; other countries and purchased locally, $389,000.

The orders placed in Great Britain, which were for the most part given after limited competition with firms of other nationalities, included $438,000 worth of locomotives, $316,000 worth of carriages, $243,000 worth of freight wagons, nearly $438,000 worth of rails and accessories, $97,000 worth of signaling material, $10,706,300 worth of telegraph material, $107,000 worth of creosoted wooden sleepers, and a quantity of machinery, paints, trimmings, etc. The orders from Belgium included $739,700 worth of freight wagons, nearly $244,000 worth of bridge and roofing material, and a quantity of fishplates, bolts, nuts, for rails, spare parts for locomotives, etc. The orders placed in Germany were almost entirely for locomotives and their accessories.

SALE OF WATER-POWER FROM THE POWER COMPANY'S POINT OF VIEW.*

BY C. E. PARSONS, CHIEF ENGINEER HUDSON RIVER ELECTRIC POWER COMPANY.

There are three important factors which have to be considered in determining the cost of hydro-electric power for a railway system: the first cost of the power plant and distributing system, the amount of power to be delivered, and the load-factor.

There is no reason to expect a railway manager to consider a proposition for power unless there is a saving over the cost of operation by steam, and the stumbling block in the way of a contract is usually the amount of this saving. The railway companies as a rule are not thoroughly conversant with the first cost of a plant and distributing system, and do not realize the magnitude of the interest and maintenance charges.

Before considering the sale of power from the power company's point of view, it may be of interest to describe the system of the Hudson River Electric Power Company, together with some of the more important work in connection with its high-voltage transmission.

There are three water-power plants in operation, and the present plans provide for the construction of nine additional plants of capacities varying from 2,000 horsepower to 40.000 horsepower. These plants will be built as the demands for power increase. The total amount of power developed and undeveloped, owned or controlled by the company, is over 15,000 horsepower. This figure is based on the average flow of the various streams.

An auxiliary steam plant has been built at Utica, and when all the apparatus has been installed it will have a capacity of 15,000 horsepower. Another auxiliary plant of equal size will be built near the eastern end of the transmission system, and the total amount of power then available in all plants, both steam and water, will be 165,000 horsepower.

The most important plant now in operation is at Spier Falls. The construction work was begun in June, 1900, and current was put on the lines in September, 1903. (See Street Railway Review, August, 1903, page 479.) The dam is the fourth largest in the world, but will be the fifth when the Roosevelt dam in Arizona is completed. Its maximum height is 157 feet, and the total length is 1,500 feet. The power house is 80 feet wide and 400 feet long, and is designed for 10 units; six units are in operation, and the seventh will be delivering power in September.

The wheels were started in 1903 under a temporary building, and the permanent structure has been extended as fast as new units were installed. The entire building will be completed in August, and work is now progressing on the canal and penstocks, so that by October the plant will be entirely completed and the power house ready for 10 units. The eighth generator is on order, and the plans are to operate the last two machines during the eight months of high water, sending the power into the Mohawk valley. Energy for this end of the system will be supplied during the remaining four months from the Utica steam plant.

The rate capacity of the generators is 2,500 kilowatts each, and the waterwheels can develop 5,300 horsepower, so that an overload of 50 per cent can be carried for short periods. Under emergency conditions the generators have been operated at 3,400 kilowatts on an 18-hour run without an unusual rise of temperature. Experience, however, seems to indicate that it is not advisable to install wheels which will develop more than a 33 per cent overload on the generators, and all new plants will be so designed.

Under normal operating conditions the current from each generator is taken through a separate bank of transformers of the same capacity as the generator, delta connected on both the 2,000-volt and the 30,000-volt sides, but in cases of necessity the low-tension bus may be used for paralleling or for running a generator on a spare bank of transformers.

The lines leading from the 30,000-volt side of the transformers are connected through motor-operated, remote-control oil-break switches, and continue to the centre clips of double-throw air-break selector switches. By means of these latter switches a generator may be connected to either of the two high-tension buses. These buses are provided with sectionalizing air-break switches between each of the generator connections by means of which the buses may be split up into as many sections as there are generators, thus making it possible to run easily several independent circuits. There are also in the upper bus two motor-connected oil switches for sectionalizing, by means of which the different sections of the bus may be parallel or separated while supplying current. All the generators are parallel on the high-tension side of the transformers.

The secondary lines from the high-tension current and potential transformers are grounded for safety; the cases are also grounded. These secondary lines and all other lines that lead to the switchboard are carried in ducts laid in a brick wall. For voltage regulation Tirrill automatic voltage regulators are used, one being connected to each of the exciters.

The station was designed for a maximum of 30,000 volts, but the oil and water-cooled transformers for number seven and number eight units will have a capacity of 5,000 kilowatts each, wound for either 2,000-30,000 or 2,000-60,000 volts. An addition will be built back of the present high-tension end of the building, in which will be installed the automatic 60,000-volt oil-break switches which will be connected with the Utica line.

The second plant in importance is located at Mechanicsville. This plant was built in 1897, and was acquired by the Hudson River Electric Company in 1902. Power from this plant was sent over the transmission lines to Spier Falls during 1902 and 1903, and used for construction work. This plant was a striking example of poor design from the hydraulic standpoint. The waterwheels were in very poor condition, and on account of the contracted area for the head-water and tail-water it was impossible to get more than 75 per cent of the rated power from the generators. During 1903 and 1904 the entire waterwheel equipment was replaced by McCormick wheels, the head race was enlarged, and the area of discharge from the wheels was greatly increased. These changes were satisfactory, and it is now possible to run the machines at their full capacity.

The Hudson river at this point is divided by an island into two channels with a combined width of about 1200 feet. The western channel is used for the head and tail-race.

The power house extends into the river 257 feet and is connected with the island by a concrete dam 26 feet above the bed of the river. The main dam is built entirely of concrete; the up-stream face is vertical and the down-stream face has an ogee curve. The dam is 15 feet in height above the river bed, 16 feet thick at the base, and 30 feet thick through the base and apron. The total length of the spillway between abutments is 850 feet. In the western abutment are 12 waste gates, each 4x6 feet, motor operated.

The power house lies between the west bank and the island, and is practically a continuation of the dam.

The power house is divided into two parts by a head wall 6 feet thick. The up-stream part contains wheel chambers for seven 1,000-horsepower lines of wheels for the main generators, and two sets of smaller wheels for the exciters.

The down-stream portion of the power house contains the governors and electrical apparatus. The total length of the power house is 257 feet and the total width 66 feet.

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* Paper presented at the annual meeting of the New York Street Railway Association, Saratoga Springs, N. Y., June, 1906.

The tail-race is 200 feet wide, and joins the main stream 750 feet below the power house.

The water-wheel plant consists of 14 pairs of 51-inch McCormick turbines. Each unit has two pairs of wheels designed to operate at a speed of 114 revolutions per minute, and rated at 250 horsepower; the total power of each set of wheels is therefore 1,000 horsepower. The normal head under which the wheels operate is 17 feet.

The total generator capacity is 7,000 horsepower in seven generators of 750-kilowatt capacity each. They are the General Electric type, 40-cycle three-phase, with revolving fields and stationary armatures wound for 12,000 volts. The current is delivered to the line without the use of step-up transformers.

The switchboard along the north side of the generator room is of the latest design, and the circuits are so arranged that they can be split up and the various machines run on separate and distinct transmission lines.

An auxiliary steam plant of 1,000 horsepower capacity was installed during the summer of 1901. This plant consists of two 505-horsepower Heine water-tube boilers and one Hamilton-Corliss tandem compound engine of about 1,000 horsepower capacity, which can be connected by means of a rope to one of the waterwheel-driven 750-kilowatt generators, the coupling being so arranged that the change can be made in a very few minutes

The third water-power plant is located on the Schoharie creek, 7 miles south of Amsterdam. This plant was built in 1900 by the Empire State Power Company, and during the first three years had a checkered career. The first designs called for a masonry dam about 350 feet long, a canal 3,500 feet long, with 8-foot penstocks about 200 feet long, connecting the end of the canal with the power house.

The plant was completed and put in operation, supplying power to the Helderberg Cement Company at Howes Cave in 1901. During a high flood in the spring of 1901 the water cut a channel 200 feet wide around the end of the masonry dam, and also washed away several hundred feet of the canal, completely shutting down the plant. A temporary timber dam was built to close the opening between the masonry and the south shore, and the canal was replaced. The plant was again in operation early in 1903, but during an exceptionally high flood in October the water again cut a channel around the end of the timber dam, and for financial reasons the company did not make any effort to rebuild. Control of the Empire State Power Company was obtained by the Hudson River Electric Power Company in 1904. During that summer a heavy timber spillway about 300 feet long, and a timber dike about 400 feet long, were built, extending from the end of the masonry dam to a high rocky bank on the south side of the stream. Four heavy floods have passed over the structure without injury, and the plant has been in continuous operation since early in 1905.

The equipment in the power house consists of two 700-kilowatt Stanley inductor alternators, one 250-kilowatt General Electric belted alternator, and three 500-kilowatt, 2,000-15,000-30,000-volt AB General Electric transformers. The machines were originally built for 60 cycles, 11,000 volts, but have been rewound for 40 cycles, 2,000 volts.

This plant is one of five which will eventually be built on the Schoharie, and when storage reservoirs have been completed the minimum flow will produce about 12,000 horsepower on an 18-hour basis.

During the past year an auxiliary steam turbine plant has been built at Utica. The total capacity of this plant will be 8,000 kilowatts at normal load, with sufficient boiler capacity for 50 per cent. overload, giving a total output of 15,000 horsepower. Transformers will be installed for 2,000-60,000 volts so that power can be taken from or delivered to the lines.

A change in the type of construction of the transmission lines of the company is being made. All new lines are to be of the steel-tower type, and the old lines will be rebuilt with towers as rapidly as the necessary arrangements can be made.

The change to the tower type was brought about primarily by the adoption of 60,000 volts for the line from Spier Falls to Utica. Another very strong reason for the change is the short life of the wooden poles and fixtures.

The experience of the company has been that the life of a wooden pole is from 9 to 12 years, and the life of a cross arm in many instances is even less. Within the past year cross arms on 12 miles of pole line have been replaced at a cost of about $500 per mile. The first cost of material and labor for poles and fixtures was about $500 per mile, and the cost for repairs on cross arms alone during eight years was equal to the first cost of poles and fixtures. This expense consisted almost entirely of labor, as the work was done at night, on Sundays, and at such other times as the current could be taken off of the line. The poles carried two circuits, and power could be off from only one circuit at a time. Some of the poles are beginning to show signs of weakness just below the surface of the ground, and are being replaced as rapidly as necessary. All of these poles were of sound chestnut and the cross arms were of first quality Southern pine.

In order to maintain a wooden pole line in first class condition the experience of this company has shown that maintenance and depreciation amount to 20 per cent, or that the amount of money expended in 10 years is twice the first cost on the poles and cross arms.

The cost of steel towers for two circuits and ground wire, including special construction for corners and transpositions, is about $2,500 per mile. This includes first cost of towers, freight, concrete foundations, erection, and all work except labor of puting on insulators and stringing cables.

On a comparative basis the cost of steel-tower construction is five times that of the pole line. Records show that galvanized towers for windmill purposes are in perfect condition after 30 years of service, and it is therefore evident that the tower line will be the cheaper type of construction.

The cost of insulators built for the same voltage is about equal in either type of construction, but the leakage must be greatly reduced on the towers.

The effect of lightning on a steel tower line in this climate is problematical, but with the towers well grounded and with copper ground wire of large capacity it would seem as though the conditions were more favorable with towers than with the pole line.

The line from Ballston to Utica, now under construction, is being built of galvanized steel angle towers designed for two circuits, with a ground wire placed in the centre of the tower 3 feet above the top of the conductors. The towers are all of the same general type of construction, and there are three different arrangements of cross arms and insulators.

The standard towers, which are used on tangents and where the deflection angle is less than 20 degrees, weigh 4,200 pounds each, and have an ultimate breaking strength of 8,000 pounds, the pull applied at a point 50 feet above the ground and equally distributed over the four pins of the lower cross arm. The towers will also have an ultimate strength of 8,000 pounds in a direction normal to the pull of the main conductors. The transposition towers weigh 5,600 pounds each and stand the same strain as the standard towers. These towers are placed 2½ miles apart. The corner towers are of very much heavier construction, and weigh 10,000 pounds each, having an ultimate breaking strength of 17,000 pounds applied in either direction. These towers are only used where the deflection angle exceeds 20 degrees. The same arrangement of pins is used on all angles between 20 and 90 degrees.

The usual spacing of the towers is 550 feet, but the distance depends largely on the contour of the ground, some of the towers being 750 feet apart and others not more than 400 feet. The average number of towers per mile is about ten.

All towers are arranged for a separation between wires of 6 feet at all parts of the span, which necessitates a greater spacing between the insulators at the corner towers. The steel angles forming the upright members are built in the form of "A" frames, as viewed from a point normal to the direction of the line.

The view in the direction of the transmission line shows the corner angles perpendicular, with diagonal angles from the apex at one side tied to the foundation at the opposite lower corner. These angles cross at a point 25 feet above the ground and are tied to a common gusset plate. The four angles at the top of each side near the end of the lower cross arm are notched and clamped together with a very heavy cast iron clamp held with four ¾-inch bolts. The main vertical and diagonal members are held with diagonal struts and tie rods in all directions. The base of the tower is 17 feet square.

The foundations for the standard and transposition towers are built of reinforced concrete buried 5 feet below the surface of the ground. The lower part of the foundation consists of a concrete slab 4 feet square and 12 inches thick. The anchorage is a 3x3x5-16-inch angle with two cross angles, 3x3x¼ inch, riveted back to back across the bottom of the upright. The cross angles are embedded in the concrete about 4 inches above the bottom, and ¼-inch twisted steel bars, placed six inches apart, are laid in both directions immediately above these angles. A concrete column 10 inches square, reinforced with ordinary chicken wire, extends from the flat concrete base to a point 8 inches above the surface of the ground, completely surrounding the vertical 3x3-inch angle. The foundations for the corner towers are 5 feet square, and the other dimensions are the same as for the standard towers. There are, however, two upright angles, 3x3x5-16-inch, at each corner of the tower, and these angles are tied together with a 2x1¼-inch strap about half way between the bottom of the concrete base and the surface of the ground. All the anchorages are set with a templet to grade, and the towers are then assembled on the ground and raised and bolted to the foundation angles.

Both upper and lower cross arms are built of 3x3x⅛-inch angles, latticed, the upper arm being 11 feet 9 inches long and the lower arm 17 feet 9 inches long. For each conductor single pins are used on the standard towers, while three pins, so placed as to evenly distribute the load, are used on the corner towers.

On the transposition towers the conductor is dead-ended on two pins, thus requiring four pins in a straight line for each conductor in order to make the transpositions.

All inside pins are made of 3-inch standard pipe, and outside pins of 3-inch extra heavy pipe drawn down at the top and fitted with a 1½-inch bolt thread 2½ inches long, which engages a metal bushing in the top of the insulator. All pins have been tested with a strain of 2,000 pounds applied at a point 18 inches above the cross-arm. The pins will stand a pull of 3,000 pounds at this point without permanent deflection.

The insulators are made with four petticoats, are 15½ inches high, and the greatest diameter is 18 inches. A metal bushing with 1½-inch thread is cemented in the top of the insulator. The head of the insulator is so arranged that the pull of the tie wires is applied directly in line with the metal bushing below the top of the pin. There are 2¼ inches of porcelain between the top of the pin and the conductor. The various parts of the insulator are tested to 60,000 volts, and the insulator when assembled is tested wet to 140,000 volts. The insulators before the final test are turned bottom up, filled with water and allowed to stand 12 hours in order to be sure that all parts have been thoroughly fired and glazed. The weight of the insulator is about 45 pounds.

The conductors are 6-strand, hemp-center copper cable, the equivalent of No. 000 solid wire; the outside diameter is 1½ inches, and the breaking strength under test is about 6,100 pounds.

A ground wire of the same size and material is strung the whole length of the line. Every fourth tower is grounded by means of a galvanized iron plate, 20x30 inches, buried in moist ground and completely surrounded by six inches of crushed coke.

The conductors are tied to the insulators by means of copper cable, single 0 equivalent. There are two tie cables, one to take the strain in each direction on either side of the insulator. Each tie is wrapped around the head of the insulator, and the ends are brought back and fastened to the main conductor by a specially designed malleable iron clamp with three grooves.

All of these towers were built by the Aermotor Company, of Chicago, and were erected by the construction department of the Hudson River Electric Power Company.

One of the largest items in the cost of a system for supplying power is the substations and apparatus. There are at the present time 11 substations in operation, with capacities ranging from 1,000 to 10,000 kilowatts. The total cost of the distributing system, including transmission lines and substations, is about equal to the cost of the generating stations.

The second item to be considered in determining the cost of hydro-electric power is the total number of kilowatt-hours required. It is self-evident that an average load of 2,000 kilowatts is more to be desired than a load of 500 kilowatts, as the fixed charges and operating expenses of the distributing system in either case are practically the same. This is not exactly true in regard to the interest on copper and distributing apparatus, but this item is small compared with the operating expense and depreciation on lines, etc.

The load-factor is the third and most important item in determining the cost of power, load-factor being the ratio of average to maximum load. It is evident that when the load-factor is near 100 per cent all of the machinery is in operation on all parts of the system, and the transmission lines are carrying their full load; the entire investment will have an earning power, and the charges will be a minimum per kilowatt hour. This is an ideal condition, and one which cannot be realized. Nevertheless, it has to be used as a basis to work from in determining the cost with various load-factors. If a plant is built for supplying power for a railway only, the cost per kilowatt-hour will be higher than where power is also supplied to factories and for lighting purposes. In a large mixed system consideration must be given to the loads which are on at a time when the railway demand is low and when the machines set aside for railway purposes can be used for partially carrying other loads. The value which is to be given to these separate loads must vary according to the character of the load and the time of year.

There are two methods which may be considered in making contracts for railway energy. One is the flat rate per horsepower per year, based on the maximum demand, the other method is on the kilowatt-hour basis. In either case a fixed amount of power as the maximum load is agreed upon, and momentary overloads of 5 per cent or 10 per cent are allowed.

With the flat-rate method the power company is not interested in the load-factor, and the burden falls on the railway company. The only way for the railway company to take advantage of the cheaper hydro-electric power is by the use of storage batteries or by the operation of an auxiliary plant to carry peak loads.

With the second method of charging on the kilowatt-hour basis the power company must be protected by a minimum monthly payment. This minimum payment must be determined by the average load-factor. The load-factor, therefore, is the basis for determining the cost with the kilowatt-hour method.

The items to be considered in fixing the cost to the railway company per horsepower per year are the fixed charges, consisting of interest, depreciation, taxes, and insurance; the cost of manufacture, consisting of labor, repairs and supplies; the cost of distribution; and the cost of management. There should then be added a reasonable dividend on the stock. The sum of these items, less the dividend, divided by the average amount of power which can be supplied at the distributing stations throughout the year, determines the cost per horsepower per year to the power company. This cost with large customers determines the price which they are to pay for energy. If, now, the power company is to be subject to the loss of income due to apparatus being idle for a part of the time, on account of low load-factor, the railway company's cost per kilowatt-hour must be correspondingly increased.

The gist of the matter is that with the flat-rate method, in order to obtain the benefit of the cheaper power, the railway company must make an investment in either a storage battery or an auxiliary power plant and bear the interest and depreciation of the same; while with the kilowatt-hour method the rate to the railway company is higher but the power company bears the interest and depreciation of the apparatus which is idle part of the time, but which must be maintained in readiness to supply the maximum demand. In the kilowatt-hour method consideration should be given to the factory and lighting loads whose peaks do not overlap the railway load. In this manner the load-factor on each individual machine is increased and the railway company derives the benefit of this greater load-factor. In other words, the railway load-factor may be 45 per cent, but by means of the loads which can be carried on the plant the average load-factor on the machines supplying the railway company, which are usually running in parallel with some of the other machines, can be built up to say 70 per cent. This load-factor of 70 per cent is used instead of 45 per cent in determining the cost of the power for the railway company.

To analyze the methods of determining the cost, a concrete example will be given. The figures used are for comparison only and do not represent conditions of operations.

The maximum railway load is 3,000 kilowatts or 4,000 horsepower, and the load-factor is 45 per cent. Considering the fixed charges and cost of operation it is determined that the value of the power at the railway company's substation is $100 per horsepower per year. The cost to the railway company with the flat-rate method will, therefore, be $400,000 per year, or, if the full amount of power could be taken for 24 hours per day, every day in the year, the cost would be $.0153 per kilowatt-hour. With a load-factor of 45 per cent the average power would be 1,350 kilowatts, or 1,800 horsepower, and the cost would therefore be, with no storage battery on the system, $.0338 per kilowatt-hour. The cost to the railway company is therefore $100 per horsepower per year, based on the maximum amount of power used, and the cost based on the average of 1,800 horsepower used is $222 per horsepower per year. On account of the great cost per horsepower per year based on the energy actually used, the railway company is compelled to install a storage battery and decrease the maximum demand. The maximum demand will, therefore, be 1,350 kilowatts, the average load, plus a battery loss of approximately 350 kilowatts, making the maximum demand on the power company 1,700 kilowatts, or 2,260 horsepower. The cost to the railway company for the hydro-electric power will therefore be 2,260 horsepower times $100, or $226,000 per year. To get the total cost for power there must be added the interest and depreciation of the storage batteries, which will amount approximately, on a comparative basis, to $30,000 per year, making the total cost to the railway company $256,000.

With the kilowatt-hour method the value of the power at the distributing station is the same, or $100 per horsepower per year, or $.0153 per kilowatt-hour. Instead of using the load-factor of 45 per cent in determining the cost to the railway company, the railway company is given the benefit of the average combined load-factor of the generating plant. This load-factor is 70 per cent, and the cost to the railway company is $142 per horsepower per year for power actually used, or $.021 per kilowatt-hour. The total cost, therefore, to the railway company is 1,800 horsepower times $142, or $255,600 per year.

The power company must have a minimum guaranteed monthly payment based on the maintenance of the load-factor by the railway company. The power company is also protected by the maximum demand which cannot be exceeded, and is assured of a stipulated income; so that if the railway company's load-factor drops below whatever amount is stated in the contract, the railway company will be the loser by reason of paying for power which they have not used. Thus the railway company derives the benefit of the larger combined load-factor of the plant in determining the cost per kilowatt-hour, but is obligated, by reason of the minimum payment, to keep its load-factor within reasonable limits.

It is evident that the actual cost in either case is approximately the same, but with the flat-rate method the railway company has to make a larger investment in order to take advantage of the hydro-electric power.

EXPERIMENTS IN COOLING NEW YORK SUBWAY.

The progress which has already been made in providing ventilation openings and louvres for the escape of the heated air in the New York Subway under the plan outlined by Chief Engineer George S. Rice, in a recent report, has had the effect, according to some recent comparative tests, of making the subway some six or seven degrees cooler than it would have been under last year's conditions. In spite of the increased number of trains and the therefore greater quantity of heat generated, the temperature in the subway is perceptibly lower.

An experiment which will be watched with interest, is the installation of a water cooling system at the Brooklyn bridge station. This system will be installed as two water cooling units, one for each island platform. Water will be drawn from four 8-inch wells with a combined capacity of 4,000 gallons of water per minute. Two of these wells are already sunk and a third is nearing completion. Water will be pumped from the wells at a temperature varying from 52 to 62 degrees. Each unit will be supplied with one pipe cooler through which the air will be drawn by a fan at the rate of 75,000 cubic feet per minute. Thence it will be distributed through a system of ducts to selected points over the platform where it is thought it will be the most effective. The capacity of the two units is believed to be sufficient to make a change of 15 degrees in the temperature on very warm days.

No plan has as yet been perfected for cooling the subway air at the Fourteenth street and Grand Central stations. At these points relief has been secured by the fresh air openings which have been made in the subway roof, but it was recently proposed to make at these important traffic centers an experiment with an ammonia refrigerating plant to be placed in a subway under the Rapid Transit subway. It was decided, however, that the danger of leakage of anhydrous ammonia would be too serious to make desirable the installation of the plant within or under the subway itself. There is no doubt in the minds of the engineers that an ammonia refrigerating system would be effective and it is not improbable that later such a plant will be installed at some distance from the subway, but for the present the plan has been abandoned.

CONTRACTING FOR USE OF HYDRO-ELECTRIC POWER ON RAILWAY SYSTEMS.*

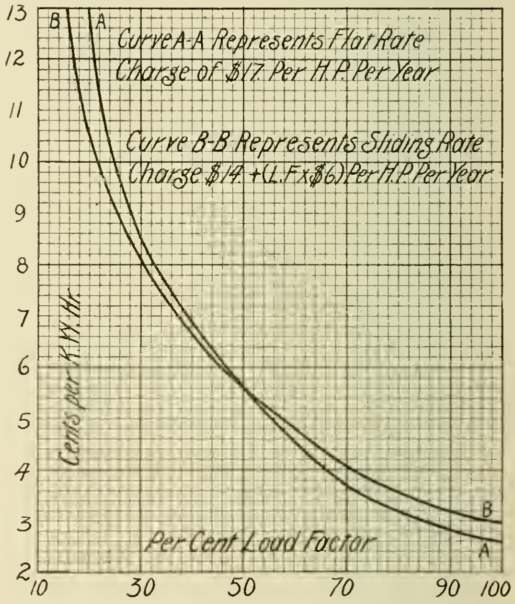
BY G. A. HARVEY, ELECTRICAL ENGINEER INTERNATIONAL RAILWAY COMPANY, BUFFALO.

The majority of railway managers and engineers in this section of the country have had occasion during the past few years to consider the subject of using electric power developed from water-power for the operation of their cars. The first point for definite investigation is invariably the matter of cost, as it has long ago been shown that electricity can fulfill all the power requirements of any sort of transportation system. If the system of the prospective purchaser happens to be so fortunately located that he can receive offers from different sources, his inquiries are apt to bring together figures which at first sight appear to be widely at variance and cause him to conclude that there are excellent opportunities for bargaining. Investigation soon shows, however, that the prices are not very unequal if the use of power under the different proposals is reduced to a uniform footing, and the fact at once becomes apparent that the most advantageous conditions are those under which the consumer uses power at a high load-factor.

The effect of load-factor on cost of power is thoroughly understood where steam plants are concerned, but it might be supposed in the case of hydraulic power, where no furnaces have to be banked and inefficiency at light loads becomes unimportant, that the conditions would be different. Hydraulic turbines of modern design, however, usually have such characteristics that their over-load capacity is very slight, and it therefore becomes necessary, if peak-loads are to be handled, to provide extra machinery to take care of these. With no provision for peaks it is still necessary to hold at least one generating unit in reserve, and a margin of capacity must be left unused in the operating turbines for gate travel in regulation, and to allow for partial clogging of distributors by refuse which accidentally enters the penstocks. As the water is available and costs no more if used to the full capacity of the plant, it is plain that the power-selling company will strive vigorously for a uniform load as high as is practicable for the installed machinery to carry. This results in making peaks a prohibitive element to power deals where the hydraulic plant has been some time in the field and has been able to discriminate in the choice of its customers. The plants now operating at Niagara Falls have been particularly fortunate in this respect, one of the oldest having a 24-hour load line of about 26,000 horsepower and fluctuations not exceeding 5 per cent of the average load. Needless to say the portion of this power supplied for railway and lighting purposes is very small. The Niagara conditions are unique on account of the electrochemical plants which provide an ideal load and consume the greatest part of the power now developed.

The foregoing is not intended to convey the idea that railways cannot contract advantageously for hydro-electric power. The typical street-railway load necessarily has prominent peaks, and, if these cannot be smoothed down by adjustments of service, it is still possible, where a fair price is asked for the water-power, to carry the heaviest part of the all-day load by means of this and the remainder by steam engines, gas engines or storage batteries, or combinations of engines and batteries.

The point is frequently raised that power companies undertaking to supply customers of any sort should be equipped to take care of all requirements of these customers, including peak-loads. This is done in some cases, the power companies going so far as to provide steam plants for reserves and peak purposes. The character of local demands for power will usually determine this matter, and if the power companies eventually install auxiliary steam plants, it will be only because they are forced to it by periodic shortages of water or inability to obtain customers whose aggregate use of power results in a high yearly load-factor. The power company wants to sell all of its power all of the time, and in a thriving, progressive community it is probable that it finally will come very near doing this. The load-factor will improve as customers increase in number, and as the load approaches the full capacity of the plant the power company will become more discriminating about closing new contracts, or renewing old ones, that involve conditions tending toward poor load-factor. When power plants are new, and struggling for an early return on investment, there are good chances of railway companies being able to contract with them for power to cover full requirements. In making such agreements it is well for railway companies to make the contract period of considerable duration, as there is little likelihood of rates being dropped by competition, except in such localities as Niagara, and there is also small chance of any other power being able to underbid the price of hydro-electric power where conditions are at all favorable to the latter. Power contracts covering periods of 20 years or more are not unusual. In drawing such agreements there should always be provision for increasing the amount of power, at the same or better rate, as the railway service grows, and it is well to specify that if power is later sold at a lower rate by the power company to other parties no more favorably situated, the railway company is also to have the benefit of such rate.



Curve Sheet No. 1.—Showing Suggested Plan for Charging for Water-Power.

If it is possible to make contracts for full power requirements, it is usual for power companies to place some penalty rate on the peak-power or to arrange the terms of charge so that there are distinct advantages to the purchaser in keeping the load line as nearly straight as possible. The most common method is to sell a solid block of "firm" power, which can be used at a load-factor of 70 per cent to 80 per cent or better, charging the minimum flat rate for this, and providing power above the firm amount on a kilowatt-hour basis at rates gradually increasing with the height of the peaks. Sometimes provision is made for charging extreme rates for possible peaks of such height that the railway company has no expectation of ever reaching them. These clauses should be avoided, if possible, as the unexpected is constantly happening in the operation and growth of a railroad Where measurement of peaks is dealt with at all, it should be specified that they are not to be counted unless they continue for two minutes or longer. Uncontrollable occurrences, such as the partial grounding of a feeder, or the performance of a defective car, may produce peaks of short duration which are of small consequence to the power company, but might be very costly to the railway company under an unreasonable power agreement.

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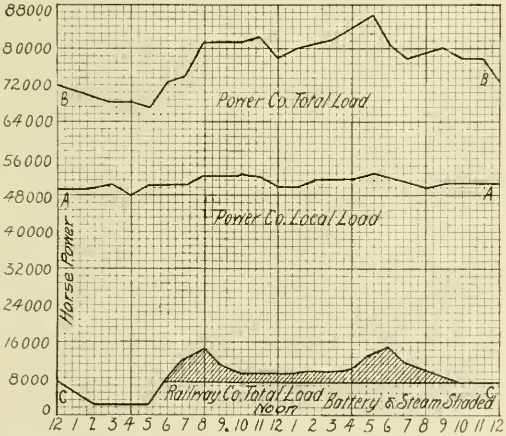
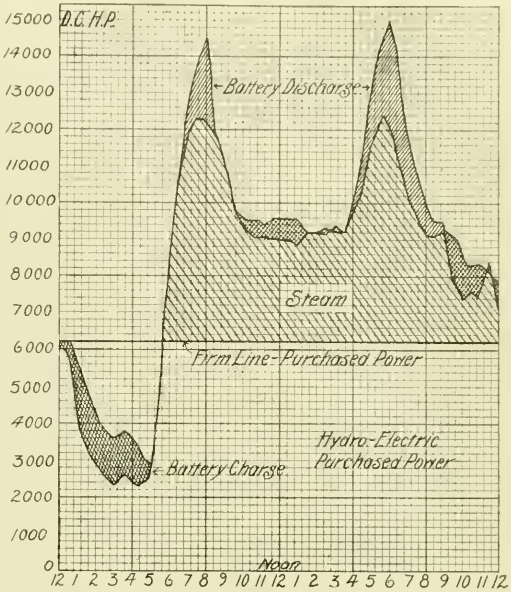
*Paper presented at the annual meeting of the New York Street Railway Association, Saratoga Springs, N. Y., June, 1906.

A very fair method of billing for power is on a sliding rate depending on the monthly load-factor. The maximum 2-minute peaks are recorded in kilowatts each day and averaged for the month. The total number of kilowatt-hours for the month, divided by the kilowatt of this average peak times the number of hours in the month, represents the monthly load-factor. The charge for the month is then made up as follows: A definite service charge plus (load-factor times a fixed amount) times average daily maximum kilowatts. A moderate penalty for peaks is thus included, and the customer pays, according to the load-factor, as nearly for what he consumes as can be expected. This method of charging is now being offered extensively by one of the companies which is about to do business over a large portion of New York State. In effect it corresponds very closely with a flat rate charge, but gives the purchaser a slightly less cost per kilowatt-hour at low load-factors, as shown by the examples on curve sheet No. 1. The total load of most any street railway is pretty sure to have a load-factor of less than 50 per cent. If the details of peak-power measurement are successfully carried out in practice, this plan of charging will probably prove popular when customers become familiar with it.

If power companies cannot entertain peak propositions at all, or if they place prohibitive rates thereon, the purchaser must then provide the steam plant or storage battery, or both, to care for a part of the load. In this case the hydro-electric power purchased should form the solid 24-hour base of the area inclosed by the total load curve, and should extend up to such height as to cover a chart area bounded at the top by a line closely corresponding with the base of the average daily fifteen-hour load line (fifteen-hour load peak). The purchaser should be allowed, without charge, swings of about 10 per cent above the firm line of purchased power, provided the kilowatt-hours used above the line do not exceed those unused below it. It is impossible to always carry the load directly on the limiting line, even with the aid of batteries and the most approved regulating devices. The 10 per cent swings should be allowed for this reason.



Curve Sheet No. 2.—Showing Load Curves of One of the Niagara Companies.

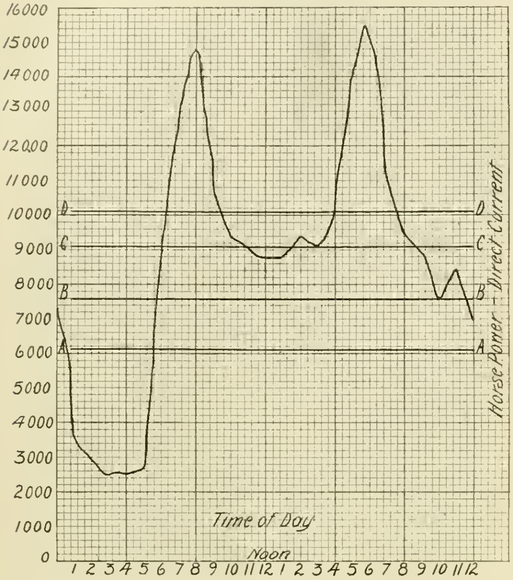


Curve Sheet No. 3.—Showing Load Line Represented as C-C on Curve Sheet No. 2.

Very careful consideration must be given to proportioning the division of load to water-power and steam-power. The cost of hydro-electric power at 100 per cent load-factor should be somewhere in the neighborhood of one-third the cost of steam-generated power at 100 per cent load-factor, assuming reasonable first cost of plant and moderate distance of transmission in the first case and average cost of coal and labor in the second. Obviously the bulk of the load should be carried by the purchased power, but the higher the limiting firm line of this power is raised the lower will the load-factors of both steam power and purchased power become, and the cost per kilowatt-hour of each will increase. There is a certain critical point, however, to which the firm purchased power line may be raised before the total cost (which is of prime importance) of combined purchased power and steam-power will commence to increase. In raising the firm line of purchased power to this point the total cost will be decreasing. It is hardly possible to evolve an exact formula for the location of the firm line of purchased power, and if one were worked out the weekly variations of load conditions would probably make its accuracy look doubtful. A safe point for this line (about as previously described) is at such height that the 15-hour daily use of purchased power will be fairly close to it at all times. It is important, in starting to make this adjustment, to know the cost of steam power per kilowatt-hour at various load-factors under local conditions

Railway systems supplied with purchased hydro-electric power afford ideal opportunities for application of storage batteries. The batteries can be charged at night with power that otherwise could not be used, and the discharge of the load peak provides power at an extremely low load-factor which costs only the fixed charges, operation and maintenance of the battery.

The possibility of power interruptions should be recognized in agreements and have penalties placed upon them. An interruption of six minutes is of comparatively small consequence to the railway and might be ignored if not repeated too frequently. Interruptions due to lightning, mistakes in switching, cable burn-outs, etc., are bound to occur, and six minutes is a reasonable allowance for testing cables and lines and returning power. Longer interruptions should entail forfeitures by the power company, increasing considerably in amount as the length of interruption increases. A mere abatement of power charge during an interruption is practically no consideration at all. Power companies by providing sufficient reserve in apparatus, lines, cables, etc., will protect themselves against penalties and insure their customers against interruptions.



Curve Sheet No. 4.—Showing Economical Location of Firm Line and Experimental Firm Lines.

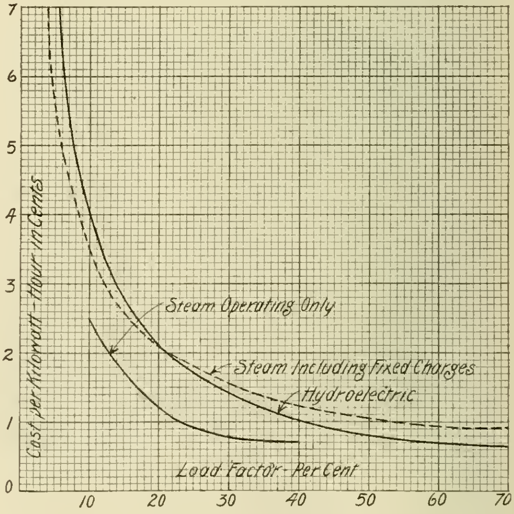
Purchased power should be delivered on the premises of the purchaser by means of cables and lines installed and operated by the power company. Measurements for determining monthly bills should be made on the purchaser's premises, the power company supplying and maintaining the meters for this purpose. These meters should be checked each month. The railway company should take daily readings from them, keeping a permanent record in chart form which will show hourly changes of total load and any important subdivisions of load. Such records are invaluable in adjusting the use of power to the most economical conditions and in figuring on extensions of the system. They are needed for daily reference, and, if the meters on which readings are taken for rendering bills do not provide proper character of measurements for making up load curves, other suitable instruments should be installed.

Curve sheet No. 2 shows at "A-A" the remarkably straight local load line of one of the Niagara power companies. At "B-B" is shown the total load line, including the long distance load, of the same company. "C-C" shows a railway load, the shaded portion of which is carried by the railway company's steam engines and storage batteries. The unevenness of the power company's total load is not contributed to by the railway company except to the extent of a dip during the early morning hours. The peaks of the railway load would, if included in the power company total load, distort it considerably in an undesirable way. The curves are all plotted from the same base line and represent the same day.

Curve sheet No. 3 shows on a more open vertical scale the same railway load that is represented at "C-C" on sheet No. 2. The firm line of purchased power is here located lower with reference to the total load than has been described as the economical point. This is partly for the reason that the chart represents a winter day (the heavy load season of the year). The total load drops below the firm purchased power line during the middle of the day at some seasons, and, as the firm line cannot be shifted back and forth, there are necessarily times when the proportions of purchased power and steam are not the most economical, as in the instance of this particular day.

In cases where steam plants are already in service on railway systems when the companies commence buying additional power, the interest, depreciation, etc., on these plants, although charged to total cost of power, should not enter into the cost of steam-generated power when balancing up the amount of this to be used in conjunction with the purchased power. The steam plant fixed charges continue, regardless of the power turned out, and only the actual operating expenses (coal, labor, etc.) should be figured against the steam power in this case. If the steam plant is installed, either at or after the time of contracting to buy power, the fixed charges might be considered as against "peak power," but it does not alter the case materially in proportioning the amount of steam power to be used. Operating costs per kilowatt-hour at various load-factors and the normal capacity and dependable overload capacity of the individual power station units are the governing features.

[On the completion of the reading of his paper, Mr. Harvey submitted a discussion of some points in Mr. Storer's paper which he illustrated by diagrams.—Eds.]

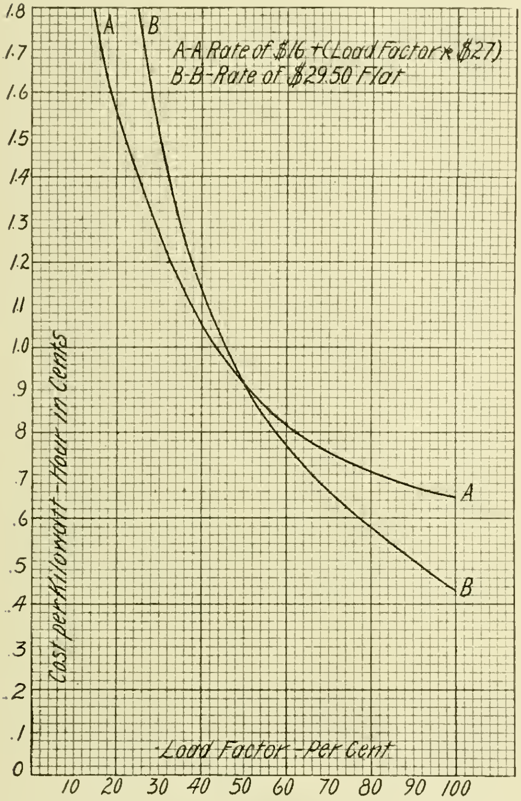


Curve Sheet No. 5.—Reproduction of Curve Sheet No. 2, on Page 408, with Curve for Steam Operating Only.

As an example of the economical location of the firm line of purchased hydro-electric power, the load curve shown on sheet No. 4 is submitted. The experimental firm lines are located on the total load curve at the points AA, BB, CC and DD.

With the firm line at AA there are 96,601 kilowatt-hours with 96 per cent load-factor below the line, costing $454.02, and 56,506 kilowatt-hours with 33 per cent load-factor above the line, costing $847.59, or a total power cost of $1,301.61.

With the firm line at BB there are 117,216 kilowatt-hours below the line, with 87 per cent load-factor, costing $586.08, and 35,891 kilowatt-hours above the line, with 26 per cent load-factor, costing $620.91, or a total power cost of $1,206.99.



Curve Sheet No. 6.—Curves Showing Variable and Flat Rates.

With the firm line at CC there are 134,470 kilowatt-hours with 83 per cent load-factor below the line, costing $699.24, and 18,637 kilowatt-hours with 16 per cent load-factor above the line, costing $447.28, making a total power cost of $1,146.52 for this location of firm line.

With firm line at DD there are 140,459 kilowatt-hours below the line, with 78 per cent load-factor, costing $814.66, and 12,648 kilowatt-hours with 13 per cent load-factor above the line, costing $354.14, or a total of $1,168.80.

Taking Mr. Storer's example of a rate per horsepower per year of $16+ (load-factor × $27) and plotting this in terms of cost per kilowatt-hour at various load-factors, we have a curve as at AA on sheet No. 6. As power companies seldom hesitate to offer a flat-rate contract, it would seem that the rate depending on load-factor could be appropriately compared with the flat rate which comes closest to the same effective cost per kilowatt-hour. Such flat rate would be the one which equals at 50 per cent load-factor the 50 per cent load-factor of the $16+ (load-factor × $27) rate. This flat-rate curve is shown at BB and represents a rate of $29.50 per horsepower per year. There is an inconsistency in this, as the rate depending upon load-factor makes the cost to the customer lower at a low load-factor and higher at a high load-factor, which is contrary to the arguments which are always presented by power companies. This same inconsistency exists in the rates shown on curve sheet No. 1, but the differences between the lines are not so great.

These costs are based on the assumed figures of $50 per horsepower per year at 100 per cent load-factor for steam power, and $30 per horsepower per year at 100 per cent load-factor for hydro-electric power, as shown on curve-sheets No. 1 and No. 2 of Mr. Storer's paper on "Sale and Measurement of Power."

It is to be seen that in raising the firm line of purchased power from the point AA, the total cost decreases up to the point CC, and then increases at the point DD. The economical location for the firm line at these prices for power is, therefore, somewhere in the neighborhood of the line of CC, which represents, as previously suggested, the base of the 15-hour load peak.

As mentioned in the last paragraph of the paper on "Contracting for Use of Hydro-Electric Power," the fixed charges on the steam plant should not be considered in determining the relative amounts of steam power and purchased power to be used, but merely the operating costs should be considered in connection with the steam-power in this case. (The fixed charges on the steam plant still enter into the total cost of power.) Curve sheet No. 5 shows a reproduction of Mr. Storer's curves on his sheet No. 2. There is added, however, another curve showing operating cost only of steam-power per kilowatt-hour at various load-factors. Using figures derived from this latter curve, the firm line of purchased power would obviously be located at a lower point than CC on sheet No. 4, and instead of the steam plant being economical only under conditions where the load-factor is 20 per cent or less, it is economical over a considerably greater range, as the curve of operating cost of steam plant will cross the water-power curve at a point somewhere near 50 per cent load-factor.

Annual Report of the Montreal Street Railway Mutual Benefit Association.

The third annual report of the Montreal Street Railway Mutual Benefit Association for the fiscal year ending April 30, 1906, has been issued. The association has 1,846 members. Since the organization of the association there has been distributed on account of sickness and medical attendance, pensions, deaths and burials a total of $34,323. At Christmas a donation of $3,000 was received from the Montreal Street Railway Company, which with certain other regular contributions from the company made the total amount received from the company $13,461. This latter amount together with the membership fees and dues amounting to $10,757 and other receipts from investments amounting to $6,482, make a total revenue for the year of $30,700. The expenses for the year were $21,705, leaving a surplus of $8,995.

For membership in the benefit association an entrance fee of $1.00 and a monthly payment of 50 cents are collected. In case of disablement the members receive, after the first six days, 60 cents per day for 90 days and 30 cents per day for the following 90 days. They also receive free medical attendance and medicines and 20 per cent discount on all medicines required by members of their families. When members become too old to work they are pensioned. In the event of death a life insurance policy of $500 is paid and $50 is allowed towards the cost of funeral expenses.

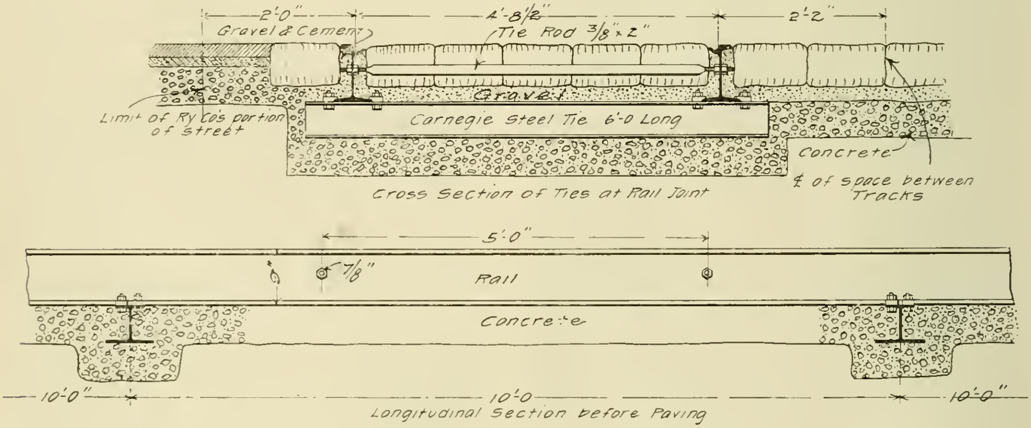
STANDARD TRACK CONSTRUCTION IN BUFFALO.

The International Railway Company, of Buffalo, N. Y., last spring adopted as its standard track construction for paved streets 9-inch semi-grooved rail weighing 94 pounds per yard, laid on concrete 6 inches thick, with Carnegie steel ties 6 feet long placed 10 feet between centers, and 2x$\frac{3}{8}$-inch tie rods placed 5 feet between centers. At the ties, concrete is tamped 6 inches deep under them. The details of this construction are shown in the drawing. The Carnegie ties weigh 19.7 pounds per foot or 118.2 pounds each. They differ from the ties of this section, now in use on several steam railroads, only in being 6 feet long instead of 8 feet or 8½ feet as called for in some of the latest construction.

New Track in Buffalo—Ready for Paving.

The railway company is now building on Filmore avenue some 58,000 feet, single track, of this construction.

The company has for some time used a similar roadbed with wooden ties and tie rods, but has abandoned the use of wood for this purpose because a proper bond between the wood and concrete cannot be had, and in a short time the wooden ties worked loose, starting a rapid deterioration.


2'-0"
4'-8½"
2'-2"
Gravel & Cement
Tie Rod ⅜" x 2"
Gravel
Limit of Ry Co's portion of street
Carnegie Steel Tie 6'-0 Long
Concrete
℄ of space between Tracks
Cross Section of Ties at Rail Joint
5'-0"
⅞"
Rail
Concrete
10'-0"
10'-0
10'-0"
Longitudinal Section before Paving

New Track in Buffalo—Sectional Views.

The halftone engraving shows this construction in Sycamore street, east of Michigan.

CAR INSPECTION AND CLEANING.*

BY D. F. CARVER, GENERAL SUPERINTENDENT, ROCHESTER RY.

The roadbed and track may be the finest in construction; the alignment and grades may be the result of much money expended; the power house may have all the appliances and shop kinks for keeping the current on—as nearly as may be —constantly; it may even be a double-tracked suburban line, and, if a single-track high speed one, its dispatching system may be perfect; the crews may be most thoroughly trained and efficient; the motor equipments may have much surplus capacity and be of the most reliable design,—but, if there is not a regular and efficient equipment and car inspection the trains do not get over the road; the traveling public becomes dissatisfied at delays which it cannot account for, and blames the management for some vague shortcomings which it does not understand,—but perhaps may think it does.

This subject of regular and systematic inspection is a very old one on railways, but in the drive of every day business on our fast growing electric properties, whose equipment is required to run excessive mileages at long periods of the day, the question of thorough and systematic inspection becomes of less and less importance in the pits, behind the front doors of a good, warm car house, as the day grows from midnight on to 4 a. m., or perhaps later. But as we sit in our offices the next day, and read our daily reports of crippled cars that had to be turned in, etc., then the subject of car and motor inspection is a most important one, worthy of most serious consideration and attention by the management.

Car inspection and cleaning is expensive,—there is no getting away from it. It's expensive if you do, and it's also expensive if you don't. One can take his choice. The accountant doesn't bother his head about it.

There isn't any legitimate way that a street railway company can better advertise itself to attract chance business than through the operation of cheerful, painted, polished cars, with clean interiors. The esthetically beautiful car, in a town of hustling business and civic pride, will draw enough more trade (passengers) than a dingy, dirty, unkept car, to pay the additional cost of its up-keep.

The cleaning of cars is slowly becoming a too elaborate and unwieldly operation for street railways to keep up, and it is now up to some one to get his inventive genius to work and devise some method of doing it at least more quickly, if not more cheaply. With water to waste, and a little of the right kind of soap applied with the right proportion of elbow grease at moderate temperature of air in winter time, the outside of a car can be cleaned up and polished with neatness and dispatch. But the inside of the modern cross-seat city car is different. The small space behind the hot water pipes collects any kind of rubbish, provided its bulk is not prohibitive; if so, it then goes under the seats between the foot-rests, which is not so bad at that, for it can be got out by the car cleaners without taking the car apart.

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*Abstract of paper presented at the annual meeting of the New York Street Railway Association, Saratoga Springs, N. Y., June, 1906.

And then there are the windows and the upper deck; the head-linings and lamps; and disinfectant now and then, until it sums up to 30 to 50 cents a day to keep a car clean, depending on the size of the car, half as much as the steam railway division spends in keeping its palatial equipment spick and span. And the end is not yet until someone devises a simpler and better method of interior car cleaning. There must be a demand, sooner or later, for simpler methods, and quicker ones, in car cleaning, and this may be helped along by some changes in the floor work of our cars.

Whether or not a car should be cleaned in an operating depot, as it stands over pits and in amongst other cars, at any temperature that may happen to be in the shed at the time, or whether it should be cleaned in a separate wash-house, where water is plenty, drainage is good, temperature is right; or whether it may stand protected in winter until thoroughly dry and in summer protected from dust, is a question to be argued on at this meeting. I hope we can settle it. We are doing on our own road, now, what we think is best, and would like to have it settled, naturally.

There is the question of cost, and also the inconvenience of shifting all cars into and out of a special house to clean them. It would be very interesting to the writer to listen to a further discussion of this matter from those who are doing one way or the other, or both.

Some months ago the writer had the honor to write a paper for this association, advocating trip inspection on a line where the time for inspection between cars was never more than eight minutes, sometimes less than six minutes. We were at that time making the experiment on one of our lines to see for ourselves if an inspector could really inspect —in such a limited time,—or whether it was all a bluff. The result to date may be of some interest.

In May, 1906, the number of crippled cars on the one line where inspectors were stationed was .80 per cent of the number operated; on the other lines the number of crippled cars was 5.89 per cent of the number operated; this a reduction in crippled cars of 5.09 per cent of the total number operated. The corresponding reduction for April was 5.20 per cent; for March, 6.78 per cent; for February, 7.37 per cent.

As for the car bodies themselves, there is really very little need for systematic inspection as a specialty. The crews can report on proper cards the damaged condition of any car body, in ample time to avert trouble, and experience has shown that they are entirely capable of doing so. Then the art of car building has so progressed that one can tell at a general overhauling which part will not last till the next one, and can replace where necessary.

Broken glass is the cause of much trouble and expense between shoppings, but there is no help in sight for that. Some have tried using plate glass, which shows a smaller percentage of breakage, but still at higher cost than the thin glass, so its use is very limited. It might be well to try a combination of AA glass and plate glass, instead of using all one kind or the other. There are a number of lights in the average car which, if of heavy glass, would not break easily and would still be comparatively cheap because of small size.

If the inspection force has any motto at all it should be that "it is easier to produce the results required than it is to make excuses for failure."

NEW CAR HOUSE AND SHOP OF THE ILLINOIS TRACTION SYSTEM AT DANVILLE, ILL.

The Illinois Traction System has recently completed at Danville, Ill., a new car house which will care for the rolling stock of the city lines of the Danville Railway & Light Company and the several interurban lines of the system which terminate at Danville. The construction is of a simple and substantial type and according to the most approved practice. The new car house is located at the south end of Vermilion street, two blocks from the public square, which is the starting point of the interurban cars, and two blocks from the power house.

The building is 100x200 feet in floor area, is one story in height and is of fireproof construction throughout. The walls are of brick. The roof, which is of concrete reinforced by wire mesh, is carried on steel trusses supported in the interior of the building by 6x12-inch built-up I-beams. Seven tracks enter the building from a single track on Vermilion street. The doorways are 18 feet in height and are equipped with Kinnear rolling shutters separated by 8-inch I-beams. The floors of the barn are of concrete throughout.

Danville Car House—Interior of Repair Shop.

To the south of the building there is an eighth track 200 feet in length, which is used for storage purposes and for the repairing of coal cars. It is planned, some time within the coming year, to extend the present building 75 feet to the south and thus to provide for five more tracks.

A brick partition wall extends the entire length of the building and divides it into two parts. The part to the north is used as a repair shop and is 35 feet wide and 30 feet in height. It contains two tracks extending back into the shop a distance of 140 feet. Each track is served by a pit 52 inches deep and extending the entire length of the track. The pits are of standard concrete construction. The track rails rest on 6x12-inch timbers embedded in the concrete of the walls of the pit. For handling motors and armatures Barrett ratchet jacks of 4,000 pounds capacity each are used. Connections for compressed air for blowing out the motors are also supplied. The pits in this part of the building are furnished with self-closing galvanized iron waste cans. For draining the pits there is an opening at one end of each pit which connects with the city sewerage system. The pits are each lighted by 10 incandescent lamps spaced 8 feet apart. For close examination of trucks and motors a flexible extension cord is used. Steam pipes for heating the building are located in recesses in one side of the pits 6 inches deep and 24 inches high. There are six pipes in each pit. Steam for heating purposes is obtained from the nearby power house. Lockers for repair parts are placed along the north wall. On the south wall there is a large rack for wrenches and the room also contains a well-equipped work-bench. At the forward end near the door there is a large run-board. The room is lighted by four skylights in the roof and a liberal arrangement of windows. At night light is furnished by four arc and 30 incandescent lights.

The rear portion of this division of the barn is used as a machine shop. The equipment consists of a drill and emery stand, a 24-inch lathe, a 150-ton Schaeffer wheel press, a 40-inch wheel lathe and a 50-inch Niles boring mill. The pits and machine shop are served by a traveling crane of 10,000 pounds capacity manufactured by the Northern Engineering Works. The crane travels on 18-inch I-beams at a height of 16 feet above the floor and is equipped for motor operation. It is fitted with chain hoists.

Danville Car House—Interior of Storage Room.

To the north of the repair shop there is an addition 25x50 feet in size, which contains a well equipped blacksmith shop and an armature winding room. The armature winding room contains a winding machine, armature racks and a brick baking oven 6x10 feet in size.

The southern division of the building is used for car storage, washing and inspection purposes, and is 65 feet wide and 40 feet high. It contains five tracks, which extend the length of the building. The two tracks nearest the repair shop are each served throughout their entire length by pits similar in construction and equipment to those in the repair shop. The storage room will accommodate eight interurban cars and 18 city cars. Four interurban cars may be accommodated in the repair shop, thus giving the building a capacity for 30 cars. It is planned to install two swinging cranes over the southern one of the two pits, one crane at each end of the building. These cranes will be supported from the built-up columns carrying the roof trusses and will have arms 6 feet in length. The room is well lighted by day and six arc and 30 incandescent lights are used for illumination at night. At the end of the tracks in this room there have been placed simple and effective stop blocks. These blocks are of oak timber about six inches high and two inches thick bolted to the rail by means of iron straps. Although the construction of the building reduces the possibility of fire to a minimum, there have been installed as additional protection three fire plugs, each supplied with 100 feet of hose. Water for these plugs and for car cleaning purposes is piped from the city mains. Fire buckets and extinguishers are distributed at convenient points about the room. Along the east wall of the room are lockers for the men and a rack for repair parts and tools.

The old shops, which are located a block north of the new structure, are now used as paint and carpenter shops and for storage purposes. They will house about six cars. It is planned to construct a brick oil house just north of the new barn. This house will be 15x30 feet in floor area. The company has recently leased a small brick building situated across the street from the new barn, which will be used as a club house for the employes and will contain a reading room and toilet facilities.

Danville Car House—Exterior View.

The Northern Texas Traction Company has recently fitted up at the car barns in Fort Worth a club room for its employes, containing comfortable chairs, reading tables, a writing table, a bookcase and all the leading periodicals, and has promised to install a library in a short time. A committee of three employes has been appointed to have charge of the club room.

PIPING AND POWER STATION SYSTEMS.—XIX.

BY W. L. MORRIS, M. E.

Stoker Operators.

The majority of stokers are operated by an engine, and the exhaust in some cases being fed in under the grates, the clinker is thereby broken up and does not adhere to the grates. In other stokers it is required that the exhaust be used to protect the castings used in connection with the furnace. The stoker steam unit should be connected to the exhaust main in such a manner that its exhaust can be delivered to the exhaust main without going to the furnace. The furnace can then take the exhaust from the main if the engine is not running, as the engine can discharge direct to the furnace if it is necessary to shut off the main.

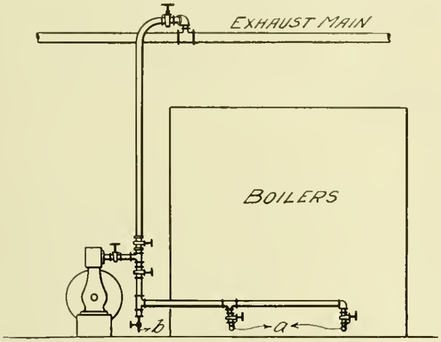


Figure 173—(C18-1).

This can all be provided for in a simple manner by adopting the design shown in Figure 173—(C18-1). If the engine supplies more steam than the stoker requires the excess flows to the exhaust main. If the engine does not furnish sufficient steam the extra amount will flow from the main. The branches indicated by a, should always be the low connections, otherwise the low line will accumulate condensation and if the furnace valve is opened to a considerable extent, this condensation will then be thrown over and crack the hot castings. The practice of working the small amount of condensation that accumulates in the low line through the furnace all the time is considered safe, but it is dangerous to pick up a "pocket" of water and throw it upon the hot iron. In starting up the engine the drain b should be left open for a time.

With under-feed stokers the exhaust line should be run under the floor and if the slide valves of the cylinders are located at the rams the exhaust and drips can be led to any exhaust main that may lie in the boiler room basement. Unfortunately, there are few installations provided with basements for exhaust mains and the piping for such stokers is usually one of the crudest details to be found in a system of station piping.

Figure 174—(C18-2) illustrates the older method of reversing the strokes of the rams with the reversing valves located at the ram cylinders. The arrangement shown in Figure 175—(C18-3) is laid out on the same principle as the older form with the difference that in the new form the reversing valves are located away from the ram cylinders and long pipe ports are used from the valve to the cylinder. The reversing valve is operated by a steam pump cylinder with its time regulation governed by oil resistance. The port opening in the oil by-pass from one end of the cylinder to the other is increased or decreased by means of a hand-operated valve. A check valve is placed between the two ends of the cylinder which allows an unobstructed passage of oil on the instroke of the rams and forces the oil through the resistance on the outstroke.

The design shown in Figure 174 requires more mechanism to convey motion from the controller to the cylinder valves, but it reduces the port length to but a few inches. The steam and exhaust lines in this older style of controller have their flows always in the one direction and the drips are being constantly worked out of the lines. The pressure of the steam in those lines is always maintained and is not wasted to the atmosphere at each stroke as is the case in the design shown in Figure 175. This later form possesses the advantage of being free from levers, rock shafts, etc., and thus makes a cleaner device in the boiler room. In the latter arrangement the two lines to the cylinders cannot be drained and the condensation causes much snapping and cracking from one line to the other. This makes it impossible to lubricate the ram cylinders and increases the stresses and wear on the entire stoker-operating mechanism.

The desirable features in stoker-operating machinery include elimination of all rock shafts, levers and similar parts, and the maintenance of a constant pressure and direction of flow in the pipe lines. At present each of the two styles just described complies with one requirement and fails in the other. A desirable feature which neither of the two types provides is that the ram shall remain in until the controller starts it for another charge. The ram should then make the outstroke and the instroke immediately following each other and then remain in until it is again started by the controller. If this method is followed the coal will not cake around the mouth of the bore to the retort and thus prevent the ram from entering.

These are more in the nature of machine than piping details, but as has already been stated many other details must be considered in order to provide a good piping system. The piping, whether it has the arrangement shown in Figure 174 or 175, should not be buried, confined or subjected to the corrosive action of cinders and water. Such piping should be free to expand and should at all times be accessible for repairs. The stoker contractor should be asked to furnish the lower part of the boiler front, the controller, the stand to carry the ram cylinders and possibly the cast iron conduit as shown in Figure 176—(C18-4). All these details should be furnished completed so that the steamfitters can place the pipe work and the masons build in the floor. If there is a basement under the boiler room floor the stands only would be required as the piping in this case could be placed below the ceiling of the basement.

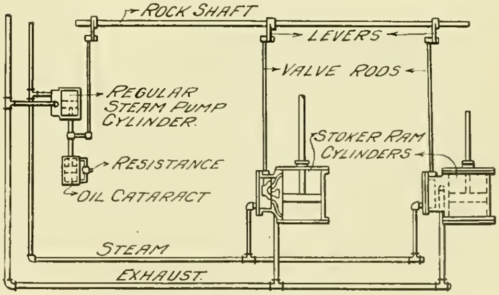


Figure 174—(C18-2).

Exhaust to Roof Conductors.

In a non-condensing plant where steam is exhausted to the atmosphere it is advisable to warm the roof conductors with exhaust instead of live steam as a large quantity of the exhaust steam is wasted in any case. However, as the live steam has sufficient pressure and if there is a partial passage through the conductor where the most trouble occurs, it will be found that live steam can be more readily forced to the roof.

Exhaust Heating Systems.

The many details of heating systems will not be exhaustively considered here except as they form a part of the power station equipment. The subject of heating is one of considerable importance for isolated stations and for large buildings. In an exhaust heating system the return drips are in some cases quite sufficient to feed the boiler and in this event it may be necessary to deliver live steam to the exhaust system in order to maintain the desired back pressure. In this case the generating and auxiliary machinery should be run non-condensing with a back pressure on the exhaust. In fact the heating system should be the chief duty of the plant.

A power station is not often designed for supplying steam to a heating system and wherever heat is taken from the plant for such purposes it is somewhat difficult to provide for, as the amount of heat required is usually comparatively small. If a 20-horsepower boiler were provided for heating a given plant it would not be considered good engineering practice to allow the condensation to go to the sewer, but if the plant had a 20,000-horsepower boiler capacity the same amount of steam and drips may both go to waste and but little note be taken of it. The losses and waste in a station seem to be measured by the ratio of the loss or waste to the entire amount of steam generated, and a five per cent loss in a small plant often attracts as much attention as the same percentage of loss in a plant 100 times as large.

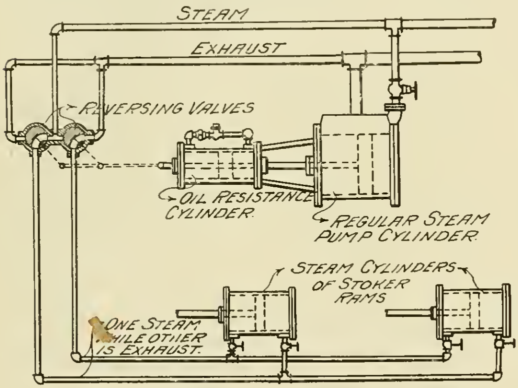

STEAM
EXHAUST
REVERSING VALVES
OIL RESISTANCE CYLINDER
REGULAR STEAM PUMP CYLINDER
STEAM CYLINDERS OF STOKER RAMS
ONE STEAM WHILE OTHER IS EXHAUST

Figure 175—(C18-3).

Ordinarily the total amount of steam taken from the power station for heating purposes is quite small, but if there are car shops, barns and offices to heat, it is a good plan to heat them with the exhaust steam. For instance, a car shop for a railway system with a power station of 6,000-kilowatt capacity might require for heating purposes a 40-horsepower boiler. Should it be necessary to supply steam to heat storage barns, offices and similar buildings it would be safe to estimate for 60-boiler-horsepower capacity for the heating of a 5,000-boiler-horsepower station. Of the total amount of steam the percentage used for heating is about 1.25. If the exciter engines have no other load than that of excitation, the exhaust of one engine will be just about enough to take care of the heating system.

The heating system, together with the heater auxiliaries, etc., should be connected to the atmospheric exhaust system. Heating system requirements cannot be determined to any great degree of nicety. There will be a constantly varying demand for exhaust steam and since the supply of exhaust steam is determined by the quantity of steam used to generate power the boiler feedwater fed through the economizers may vary in temperature between 125 and 210 degrees. There is no serious objection to this change in feedwater temperature, nor is there any other way to better the economy. For a condensing plant using economizers it would be quite wasteful and unnecessary to deliver live steam to the heater in order to maintain a high water temperature.

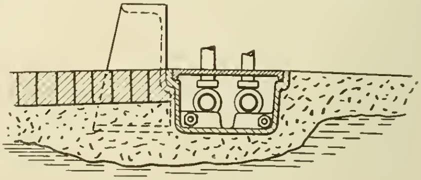


Figure 176—(C18-4).

The system of exhaust steam heating which is being considered may be operated with a back pressure on the auxiliaries or a vacuum return system on the heating coils and radiators. If a vacuum return system is used the air should be allowed to enter and be discharged from the heater as shown in Figure 166. If the air were removed from the heater it would cause a vacuum on the heater as well as on the heating system. The vacuum pump for a heating system should be independent of the other station apparatus in order that it may be shut down in the summer and run at night in case all other machines were shut down. The vacuum pump should deliver the return condensation and air to the exhaust heater, allowing the air to be precipitated and leave the heater through the vent.

If the plant is provided with surface condensers and but a small amount of steam is required for the heating system, it may be found simpler to return the air and drips to the surface condensers as shown in Figure 177—(C20-1). The drips should all flow to the drip receiver as shown. The riser, a, should be as short as possible and of small diameter in order to insure a high velocity. The drain, b, should be given a slight pitch to the condenser and can be of a larger size of pipe than a, since high velocity in this pipe is not essential. If the heating system warms the car shop the drip receiver should be located at that point. The reducing valve, c, is in reality a safety or relief valve arranged to blow off its absolute pressure of 10 pounds, the results obtained being practically the same as though the exhaust were under a 3-pound back pressure. This 3-pound vacuum on the drains would lift a solid drain in the line a, a distance of about six feet. If the drain can be returned as shown by the dotted line d, less vacuum will be required on the drain system. The objection found in draining to the condensers is that much difficulty may be encountered at night when the plant is shut down and the drains are not working. If the

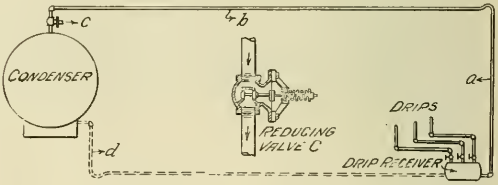


Figure 177—(C20-1).

plant is to be shut down for three or four hours at night during severe weather it will not be safe to stop the drains.

Figure 178—(C20-2) shows a back-pressure exhaust heating system and its exhaust lines. With the heater under atmospheric pressure the valve a, may be set for 30 pounds if necessary as the heater is not subjected to the back pressure. The valve b, should be set for about one pound. If the drain c, could be pitched to the heater as shown, the back pressure could be quite small; but if the drain lies lower than the heater as shown at d, it will then be necessary to increase the pressure enough to raise the water in the riser, e. If the riser e, is say 10 feet long it may be then found necessary to run the back pressure up to six or eight pounds. Gages should be placed on the exhaust main and on the heater to show the set of the back-pressure valves.

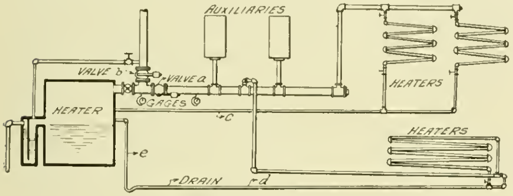


Figure 178—(C20-2).

The system shown in Figure 178 requires no additional apparatus and the condenser need not be of the surface type nor be run so as to remove the drips. The exciter engine would in all probability be run to supply current for the lighting system, even though the plant were otherwise shut down. A live steam connection can otherwise be made to the exhaust main and used when there is not enough exhaust steam to maintain the necessary pressure. A reducing valve can be set to open the live steam connection into the exhaust system whenever the pressure in the exhaust main drops to three pounds. It may be found that this exhaust system can be more economically operated by wasting the drips to the sewer than by carrying the necessary back pressure to elevate and return the drips through a considerable distance to the heater. With drip returns as shown in Figure 178 there would be no heat lost due to wasting condensation nor by leaving the drain valve open so the steam will blow through to the atmosphere. In fact, the capacity of the heating system would be very materially increased by using the returns c and d. The steam which does not pass through these returns to the heater would be free to pass through the valve a.

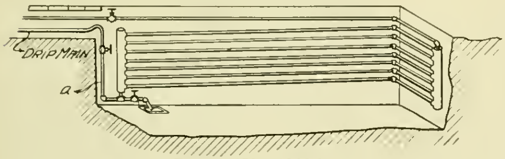


Figure 179—(C20-3).

The arrangement of this system as shown with the heater under lower pressure than the exhaust system makes the handling of drips possible in the most extreme cases. For instance, Figure 179—(C20-3) may illustrate a coil for car shop pits with the drip main on a higher plane than the bottom of the coil. But very little back pressure on the exhaust main would be required to handle the drips. If the riser, a, is 4 feet in length a 2-pound back pressure would be required to raise the drips. If the drips are blown to the sewer in starting the coil, then but a fractional part of a pound of back pressure will carry the condensation along with the steam in the form of vapor if the drain valve be left open and the steam be allowed to flow through it back to the heater. If the riser, a, is 10 feet in length and the difference in pressure of the steam supply and the drip main is but one pound, it will then require four feet of steam plus two feet of water in the form of vapor to equal one pound of back pressure. Since the steam would have a volume 1,600 times that of water it would require but one four-hundredth of the steam necessary for heating to atomize the condensation, and by lightening the column be able to raise the condensation 10 feet in a vapor column weighing one pound. Since the heating system requires from one to two per cent of the total steam and the vaporizing steam but one four-hundredth of the amount, it will be noted that the steam flow through the drip lines will be an insignificant amount and only sufficient to raise the temperature of the feedwater a fraction of a degree. The drips can then be left well open, the drains and the air well cared for, traps or vapors rising from the sewers avoided and no heating units wasted. This system is especially suited for installations requiring other feedwater than for the heating system alone and where all the exhaust steam is condensed in either the heating system or the heater.

The exhaust line to the heating system should be provided with a large grease-extracting separator having either a water seal or a trap in the discharge to the sewer. If the plant is run non-condensing and the exhaust wasted to the atmosphere, then such steam as would be blown through the drip system would cause waste due to the lost energy occasioned by the back pressure on such an amount as was used to remove the drips. The amount so used would in regular practice be considerably greater than that required for the heating system.

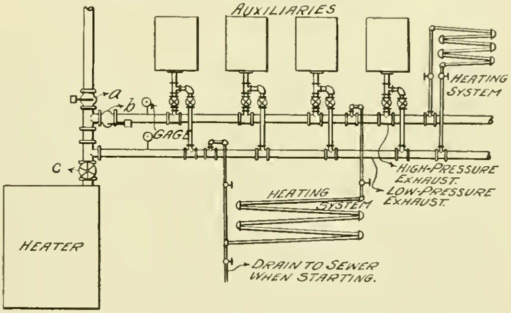


Figure 180—(C20-4).

The system shown in Figure 180—(C20-4) is applicable to non-condensing plants such as isolated stations, etc. The auxiliaries have one exhaust connection to the heating system and a second exhaust which is free to the atmosphere. The valve, a, would be set with say a quarter-pound back pressure and the valve, b, with three to five pounds, or whatever amount is necessary to return the drips. The valve, c, is placed in the heater connection to provide for an exhaust to the atmosphere if the heater should be out of service. By using two mains as shown it is necessary to place the back pressure only on such machines as are required for the heating systems.

In order to avoid the necessity of cutting the auxiliaries in or out to suit the demands of the heating system the atmospheric valves may be placed at each of the auxiliaries as shown in Figure 181—(C20-5). The valve shown in detail will blow open to the atmosphere when the back pressure in the heating main reaches some set amount, say five pounds, and when the back pressure drops to say three pounds, the valve will close to the atmosphere and discharge steam to the heating system. The valve weight should be in the position indicated by a, when open to the heating main and in the position b, when open to the atmosphere. When the valve starts to close or open it takes the full travel without stopping as the greatest change in pressure available is required to start the valve from either position.

With the heating system arranged in this manner some machines can be set to throw in before others and the last machines to go in on the heating system would be the first to go out in case of an increase in back pressure. The machines can be adjusted to throw in at any desired time by sliding the weight on the lever. Ordinarily, the best station systems are those which can easily be controlled by hand rather than those which are dependent upon automatic devices. A simple form of quick-reversing, three-way valve, if applied to the system shown in Figure 180 in place of the two valves shown in the auxiliary exhaust, would, in all probability, provide a more reliable design than that shown in Figure 181, and furthermore, it would be free from the pound of the automatic valve shown in the latter figure. This automatic valve can, however, be supplied with a dashpot and be made as quick and reliable as any atmospheric valve.

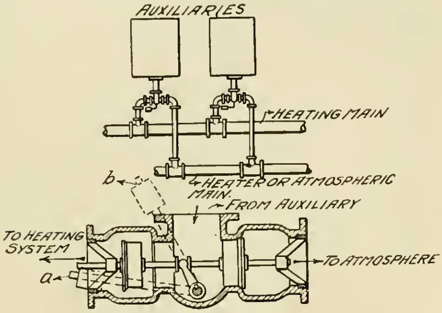


Figure 181—(C20-5).

Boiler Feed Mains and Branches to Boilers.

Since the boiler lines in a plant are frequently subjected to 50 per cent higher pressure than exists in the boilers, the feed lines should be constructed to withstand such excess pressures. Pump governors and relief valves will in time reduce the pressure to the amount set, but the fact should not be overlooked that these extreme pressures are a part of the ordinary feed line performance. This excessive pressure will occur occasionally regardless of the precautions which may be taken, but with careful attention and slow speed pumps the excess can be reduced to a minimum. Relief valves simply aid in protecting the pumps and pipe lines and do not insure the maintenance of a constant pressure.

A pump, when operated at a constant speed in connection with water relief valves, will give the following results: Reliefs that start to discharge or leak at a pressure of 60 pounds, discharge but little water at a pressure of 80 pounds. When water passes through the reliefs at the rate of 15 feet per second the pressure runs up to 140 pounds. The reliefs discharge a certain quantity of water at a certain pressure and to discharge a greater quantity a greater pressure is required. In order to prevent a constant leakage through the reliefs they should be set considerably above the working pressure, that is, if the working pressure is 160 pounds the reliefs should be set at 180 pounds. If such leakage is not stopped, it is probable that the valves will be ruined. Much of the trouble from excessive pressure can be avoided by the use of well-designed relief valves.

In the relief valve shown in Fig. 182-(D1-1) the pilot relief valve, a, is used to admit pressure to the cylinder under the piston, thus balancing the piston and allowing the valve, c, to open. There is an opening through the stem, b, by means of which the same pressure is maintained above the piston as under the valve, c. Since the hub opening at f, is made fairly tight, the pressure in the chamber, d, is wasted through the partially opened drain, e. The leakage can occur through the hub, f, only at such times as the valve, c, is open. The capacity of the valve, a, should be somewhat greater than the waste through the drain, e, in order to maintain pressure in d. The drain, e, should not be discharged into the wastepipe from the valve, c, as this pipe is under constant pressure due to the volume of water which passes through it, and the resulting pressure in the space, d, would cause the piston to close slowly. Since the piston acts as a dashpot, this valve cannot chatter on its face. If very hot water is used the piston can be made of composition metal fitted with packing rings. The valve is guided by means of the hub, f, and can be readily reground by removing the upper cylinder and clamping the hub piece with the screws which attach the cylinder.

The pilot relief valve, a, should be of a sensitive and high-grade type and if different sizes of main relief valves are used in the same plant they should all be supplied with pilot valves of the same size. A spare pilot valve should be provided for substitution in case it is desired to repair one in use. The valve, a, has but little service to perform and if it is merely off its seat, the pressure will enter the chamber, d, allow the valve, c, to open and remain open during the time the valve, a, is discharging. When the valve, a, closes, the pressure on the under side of the piston is zero. Then if it is assumed that the pressure on the upper side of the piston and on the under side of the valve c, is 120 pounds with the pressure above the valve 20 pounds, and if the piston has twice the area of the valve, c, or the area of the valve is 25 square inches and that of the piston 50 square inches, there would then be a pressure of 6,000 pounds tending to close the valve, and a pressure of 2,500 pounds tending to open it. This is a net pressure of 3,500 pounds tending to close the valve. When, owing to the opening of the valve, a, the pressure in the chamber, d, is the same as that on the upper side of the piston, there will be a pressure of 3,000 pounds exerted in opening the valve, c. When the valve, a, is closed and there is no pressure in d, there will be a pressure of 3,000 pounds exerted toward closing the valve c. The objectionable feature in the type of valve shown in Fig. 182 is that there is pressure upon the piston at all times and, therefore, a tight fit must be maintained in order to avoid excessive leakage.

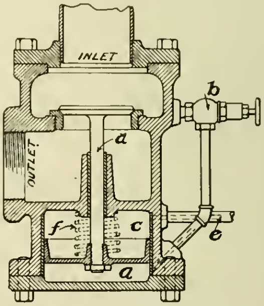


Figure 182—(D1-1).

(To be Continued.)

RECENT ELECTRIC RAILWAY LEGAL DECISIONS.

Transfer Not Required Because One Company Owns Majority of Stock in Another.

Senior v. New York City Railway Co. (N. Y. Sup.), 97 N. Y. Supp. 645. Feb. 9, 1906.

Because one street railway company has the ownership of a majority of the stock of another street railway company, the first appellate division of the supreme court of New York holds that the first-mentioned company is not required by the railroad law of the state as an operating or controlling corporation to issue transfers over the road of the second company, where the latter operates and controls its own railroad and there are no contract relations of any kind between the two roads.

Classification of Interurban Railroads—Not an Additional Burden in Cities—Motive Power Immaterial—Peculiar Distinction of a Street Railroad—Damages Where Land is Condemned Same as for Commercial Railroad.

Indianapolis Northern Traction Co. v. Ramer (Ind. App.), 76 N. E. Rep. 808, Feb. 1, 1906.

A company organized as a street railroad company, running its cars within cities and towns, and operating, also, an interurban railroad, the appellate court of Indiana says, must, within the cities and towns, cause its tracks to conform exactly to the established grades of the streets; and such use of the streets, with the consent of the municipal authorities, does not constitute an additional burden upon the real estate, and therefore, if the road be properly constructed and operated, no injury constituting ground of complaint is done to the abutting proprietors. Such use of a street is regarded as within the purposes for which it was dedicated or appropriated as a street.

But an interurban railroad, not upon land already dedicated to public use, but upon and through the lands of individual proprietors, is something radically different. It is not the motive which distinguishes a street railroad, in the original sense of the terms, from a railroad in the sense of a commercial railroad as known before the introduction of electricity as a motive power for cars. The peculiar distinction of a street railroad, properly so called, is that it is so constructed and used that it does not constitute an additional burden upon the streets, its tracks conform to the grade of the street established for the ordinary uses of a street, and the operations of the railroad do not deprive the adjoining proprietor of the enjoyment of the use of the street in the ordinary manner. At least the law remains thus, notwithstanding the developments whereby the original conditions of street railroads have been greatly modified.

But when the legislature came to make provisions whereby street railroad companies, organized as such, and not as commercial railroads, may construct and operate interurban railroads running outside the limits of streets and highways, it made provisions for the appropriation of private property by the same methods as already existed for such appropriations by "railroad companies," and, recognizing the essential difference between such interurban railroads and street railroads, it clearly indicated its intention to class such interurban railroads with commercial railroads for the purposes of such appropriations.

Now, while there are important differences between ordinary commercial railroads and interurban railroads in the appliances and uses now existing, yet in the matter of the appropriation of land for the construction of the ways, and as to the actual methods of construction of the roads through such appropriated lands and the injury thereby caused to the landowner, there is no essential difference. When the legislature, in making provision for such new, but essentially identical, conditions, re-enacted, with unimportant changes, the terms of the statute relating to such appropriations by "railroad" companies, and thereby applied the methods prescribed for railroad companies to street railroad companies with respect to their interurban railroads, the court is of the opinion that the legislature should be regarded as making such adaptation with the intent that the damages to the landowner should be assessed as in case of assessments for the use of railroads under said pre-existing statutes, in the manner and with the limitations recognized by the courts as applicable to such appropriations for "railroads."

Supreme Court of United States on Various Franchise Questions—Opposition of City Cloud on Title Warranting Suit by Receivers to Determine Rights—City Not in Position to Question Validity of Leases Between Companies—Where Road Must be "Authorized" by City it May Fix Term or Prevent Use of Streets—Effect of Act Extending Charter to 99 Years and All Contracts, etc., "During the Life Hereof"—Burden on Claimants Under Public Grant—Application of Amending Act to Additionally Named Company—Rights Extending Until City Purchases Property Not Applicable to New Interests—Grants Construed According to Systems Intended for—Silence of One Ordinance as to Term Not Controlling—Clause Saving Rights After Expiration of Time Limitation in Accepted Power Ordinances—Limitaton by Titles of Charter Acts to Use of Animal Power Not Conclusive—Abolition of Office of Supervisor Does Not Authorize Extension Without Official Consent—Consent by Township Board of Trustees Sufficient—Term of Unlimited Grant for Extension Outside of City.

Blair v. Chicago (U. S., Ill.), 26 Sup. Ct. Rep. 427, Apr. 2, 1906.

The city of Chicago having strenuously contested the asserted rights of certain street railway companies to a franchise to use the streets for the term claimed to have been granted to them, the supreme court of the United States holds that the attitude and claims of the city cast a cloud upon the title to the property, which was in the hands of receivers to be administered under the orders of the court, and that in such case the receivers might, with the authority of the court, proceed by ancillary bill to protect the jurisdiction and right to administer the property, and to determine the validity of the claims of the parties which cast a cloud upon the franchises and rights claimed by the companies and the receivers, and that in such case it was proper to grant an injunction until the rights of the parties could be determined. Moreover, the court holds that in such a case the city was not in a position to raise the question as to whether the leases under which various transfers had been made were void for want of corporate power in the companies to make or receive the same, all of the companies being parties to the suit, and the rights and franchises of all being, by order of the court, vested in the receivers, and no contract being undertaken to be enforced with the city which depended upon the validity of these transfers.

The Illinois act of 1859 incorporating, in Section 1, the Chicago City Railway Company for the term of 25 years, which, by Section 2, was authorized to construct, maintain and operate a railway, as the common council had authorized the corporators, or should authorize the corporation to do, in such manner and upon such terms and conditions, and with such rights and privileges, as said common council had contracted with said parties, or any or either of them prescribed, the court holds gave the city the right to fix the time for which the streets might be used. It says that the company must be "authorized" by the city council before it could lay or operate railways in the streets. This was more than to designate that for which authority had already been given. It was an additional grant of right and power which the legislature required the corporation to obtain as a condition precedent to its use and occupation of the streets. This power of the city, in the absence of language in the statute excluding the authority and reserving its exercise to the state, necessarily included the right to fix the time for which the streets might be used. Moreover, under the terms of this act, the city, by withholding its consent, could prevent the use of the streets by the corporations.

What, then, was conferred in the franchise granted by the state? It was the right to be a corporation for the period named, and to acquire from the city the right to use the streets upon contract terms and conditions to be agreed upon. The franchise conferred by the state was of no practical value until supplemented by the consent and authority of the council of the city.

An act passed in 1865 amended the act of 1859, and one somewhat like it of 1861 incorporating the Chicago West Division Railway Company to read, after the word "company," in the first section of each, as follows, viz.: "for ninety-nine years, with all the powers and authority hereinafter expressed, or pertaining to corporations for the purposes hereafter mentioned." Section 2, common to both acts, was amended by providing that "any and all acts or deeds of transfer of rights, privileges, or franchises, between the corporations in said several acts named, or any two of them, and all contracts, stipulations, licenses, and undertakings, made, entered into, or given,' and as made or amended by and between said common council and any one or more of the said corporations, respecting the location, use, or exclusion of railways in or upon the streets, or any of them, of said city, shall be deemed and held and continued in force during the life hereof as valid and effectual, to all intents and purposes, as if made a part, and the same are hereby made a part, of said several acts," etc. The court does not think that a fair interpretation of this clause quoted from the second section of the act extended all the franchises, privileges and contracts theretofore made for the term of 99 years. But, considering the act as a whole, it had the effect, the court holds, to extend the life of the corporations to 99 years and to authorize the use of the streets of Chicago, with the consent and under the terms agreed upon with the council, and this right might be acquired in like manner during the extended life of the corporations for such periods as might be contracted for. Contracts already made were affirmed as made. The transfers between the companies were validated. Further contracts might be entered into and amendments made without resort to new legislation empowering the corporations, as the right of amendment was given.

It is incumbent upon those claiming under a public grant, the court says, to make out the rights contended for by terms which clearly and unequivocally convey them, and it is enough to deny the privileges contended for if, upon considering the act, the mind rests in doubt and uncertainty as to whether they are intended to be conferred. It is the application of the settled rule of interpretation to such grants which invalidates the claims made for it, rather than any clear and satisfactory interpretation suggested by counsel or arrived at by the court. But grants of this character are not to be destroyed by an unreasonable or narrow interpretation.

By the 10th section of the act of 1859 all the grants, powers, privileges, immunities, and franchises conferred for the south and west divisions of the city of Chicago were conferred upon certain persons by the corporate name of the North Chicago Railway Company, for the north division of the city, as fully and effectually to all intents and purposes as if they had been by a separate act incorporated, with all of said grants, powers, privileges, immunities, and franchises. The court holds that the amending act of 1865 had application to the North Chicago City Railway Company, and had the effect to extend the corporate life of that company.

A city ordinance of 1858 gave the right to operate specified railways for 25 years, and thereafter to parties operating said railways the enjoyment of all privileges granted until the common council should elect, by order for that purpose, to purchase the tracks, etc., and Section 7 of the act of 1859 provided that "all of the rights and privileges granted, or intended to be * * * by the ordinances of the common council and the amendments thereto, are hereby in all things affirmed, and shall pass to and become vested in the corporation hereby created," but that the right to use the streets under the ordinance of 1858 was extended to all subsequently acquired rights to use the streets under the new contracts, so that the right would continue until purchase be made of the entire property of both systems of railway, the court says that it cannot concede. It would do violence to the language of the ordinance of 1858, which, by its terms, was limited to the railways therein and thereby provided for, and would be in extension of corporate privileges by implication, in violation of the settled rule previously referred to.

But where as to what it calls the west side companies the court finds running through the ordinances making grants in the divisions covered by that system a purpose to preserve the original permission of the ordinance of 1858, which granted the use of the streets for the term of 25 years and until purchase by the city, the court holds that when streets were occupied under the authority of these ordinances the company had the right to the use of the streets until the city should purchase under the contracts thus made. That in the west side system an ordinance of August 17, 1864, creating new lines, extending others, and regulating the use thereof, was silent as to the term of the grant, the court does not think indicated any intention on the part of the city, even if it had the power under legislative acts then in existence, to confer the right in perpetuity to the occupancy of the streets, a point which it does not feel called upon to decide. In this case the right granted must be construed with reference to the system of which it was made a part, and where the terms of the grant were limited to 25 years, and until purchase, the court can find no intention to grant or receive a perpetuity simply because no term of years was named in the one ordinance under consideration.

Certain "power ordinances" of 1886 and 1888 having clauses inserted to the effect that privileges as to time after the expiration of the term of 20 years were to be governed by ordinances theretofore passed, the court is of opinion that whatever rights and privileges the company had in the streets after the expiration of the time limitation in the "power ordinances" were not lost by the acceptance of the privileges conferred in those ordinances.

It was contended that the railway companies had no power to accept ordinances for the use of other than animal power in the operation of railways, because of the titles of the various acts which constituted the charter of the companies, limiting them to the use of animal power, and because of the constitutional provision that no private or local law shall embrace more than one subject, which shall be expressed in its title. But the court thinks that the intention of the legislature in this respect was not to confine the operaion of the road to animal power, but to incorporate street railway companies as distinguished from steam railways, and to endow them with the rights and privileges named in the acts. It says that Section 2 of the act of 1865 expressly gives the power of amendment, in providing that "it shall be competent for the said common council, with the written consent or concurrence of the other party or parties or their assigns to any of said contracts, stipulations, licenses, or undertakings, to amend, modify, or annul the same." The court thinks this grant of power was broad enough to authorize the city to grant, and the railway company to accept, a changed method of operation of the railways by applying thereto a new and more efficient and economical power."

Section 6 of the act of 1859 required the consent of the supervisor to the extension of the railways into townships of Cook county outside of Chicago, and the court says that it cannot assent to the soundness of the argument that the act, in the event of the abolition of the office of supervisor, during the life of the corporation, would authorize the extension to these adjoining townships of the system of railways intended to be constructed, without official consent. But when the supervisor became a member of the township board of trustees, and that board gave its consent, the court thinks this satisfied the requirement of the act in that respect.

And where permission to use some of the highways of such a township was granted, without any limit as to time, for an extension outside of the city of what the court calls the north side railway system, it holds that a fair inference would be that it was for the same term as the grants already made; and when the township was annexed to the city the grants would not extend beyond the life of the corporation conferring them.

Franchise Rights Cease on Failure to Build in Time Specified—Grant to be Construed Most Strongly Against Grantee—Grant a Mere License—Injunction Against Building One Part of Road Not Excuse for Not Building Another.

Blocki v. People on relation of South Chicago City Railway Co. (Ill.), 77 N. E. Rep. 172. Feb. 21, 1906. Rehearing denied Apr. 5, 1906.

In this case the company filed its petition for a writ of mandamus to compel the commissioner of public works of the city of Chicago to issue to it a permit to build a double-track steel railway on Torrence avenue from 106th to 110th street. The city council had passed an ordinance authorizing it to lay street railway tracks on about 35 miles of street, including a portion of Seventieth street, and on Torrence avenue from 106th to 114th street. The ordinance required the company within two years to lay and have in operation a single-track railway on certain portions of the streets, and on other portions, within five years, to have in operation a double-track railway. Permission from the commissioner of public works was to be obtained before the commencement of the work. All privileges granted by the ordinance were absolutely to cease and terminate as to any portion of the streets on which lines were not in operation within the time specified, unless the construction of said railways, or any part thereof, was delayed by the injunction of any court of competent jurisdiction, in which case the time of such delay, after notice to the corporation counsel of the city of the pendency of said injunction proceedings, was not to be reckoned as a part of the time limited.

The supreme court of Illinois says that had the railway company failed to comply with the conditions of the ordinance as to the time in which it should construct its tracks, without justifiable excuse, the court thinks the law too well settled to call for the citation of authorities that all its rights and privileges would have ceased. The court agrees with counsel for the commissioner that all grants by the public, such as were given by the city in its ordinance, are to be construed most strongly against the grantee, and, also, that the grant is a mere license or permission to the railway company to lay down, maintain, and operate its railroad in the streets upon the conditions named in the ordinance. The face of the company's petition showed that the time specified in the ordinance for the construction of the track on Torrence avenue had expired. It was the duty of the company, before it was entitled to a permit from the commissioner, and before it was entitled to a writ of mandamus, to allege such a state of facts as excused the delay in not building within the time specified. This it sought to do by alleging that the territory covered by the ordinance constituted a single system, and, as it had been delayed by an injunction from a court of competent jurisdiction as to Seventieth street, that this excused the delay as to Torrence avenue. But the court does not see any valid reason why the injunction as to Seventieth street should in any way have interfered with the work on Torrence avenue, Seventieth street, upon which the company was restrained from building its tracks, being 37 squares, or not less than four miles, from Torrence avenue, while the line upon Seventieth street was upon a cross street connecting north and south main lines of railway, which could apparently be built without any damage on account of the Seventieth street line not having been built. And the petition was not sufficient, upon its face, to entitle the company to the writ sought, in the absence of allegations showing that the part covered by the injunction was connected with the rest of the territory in such a way as to make it undesirable or inconvenient to build one without the other.

Liability for Appliances Kept in Street—Presumption Where Put in by City Authority—Injury from Catching of Wheel of Buggy at Switch—Burden of Proof.

Morie v. St. Louis Transit Co. (Mo. App.), 91 S. W. Rep. 962. Jan. 30, 1906.

The plaintiff was injured by being thrown out of a buggy by one of its wheels wedging between a switch plate and the rail. It was argued that it was a careless act to put such an appliance on the street. But the St. Louis court of appeals takes the position that the defendant was not liable absolutely for keeping an appliance in the street which, in some measure, increased the danger of travel; but only if it kept a wrong appliance (i. e., one unsafe as compared with others in use) or the right one in a wrong condition, and that whether it did either of these things or not, depended on circumstances such as the necessity for the switch, the authority under which it was laid, the degree of risk it entailed, the care employed to minimize the risk, and especially to arrange the appliances, if possible, so that it would play over so narrow an arc that wheels would not be caught between it and the rail next to it.

A street railway is for the public use, and it stood admitted that the switch in question was laid pursuant to a license from the city. Therefore, the switch was, prima facie, a lawful occupation of the street and the defendant was within its right in maintaining it, provided due care was observed to keep it in order and to select a reasonably safe appliance if different kinds were available, and provided, further, the danger and inconvenience to the public caused by the presence of the switch in the street were not so great as to make it a nuisance even if authorized by the city.

Railway tracks are a source of some danger to persons driving carefully in vehicles in common use; for it is not uncommon for the wheels of a vehicle to be wrenched off in driving diagonally over tracks, and occasionally some one is thrown to the ground in that way and hurt. Such occurrences happen with comparative frequency over the intersections of ordinary switches or side tracks with main lines. Freight wagons often get caught in street car tracks. Those incidents must be borne with, for the sake of the public service rendered by the railways. As the court has stated, the lawfulness of the obstruction depends on the necessity for maintaining it, its utility, and the degree of inconvenience and danger it entails. And this is recognized in the decisions on the subject, despite the broad propositions often declared.

Of course, the need to maintain an appliance is to be considered. Its danger may be so great that no necessity will justify its use. Comparisons must be instituted. A given implement may be somewhat dangerous, but not too much so to be used, if there is nothing safer; when, if a safer one can be obtained, it would be remiss to use the other. But this latter consideration would come up only in a case for negligence in choosing an inferior appliance.

The burden was on the plaintiff to produce evidence to prove prima facie that there was no necessity for the switch, or that it entailed such great risk as to render it a nuisance and unlawful, despite the fact that it was licensed. It is presumed, until proof to the contrary appears, that the city government paid due regard to the safety of the public in granting the license. The plaintiff having failed to present such proof, a judgment in his favor is reversed. The injury was an accident for which damages are not given.

Person Properly on Steps a Passenger—Not Seeing Motorman or Conductor Immaterial—Motorman Presumed to be at Post of Duty and Doing Duty—Presumptions from Giving of Signal and Stopping of Car—Refusing to Disclose Names of Witnesses.

Devoy v. St. Louis Transit Co. (Mo.), 91 S. W. Rep. Dec. 21, 1905.

The law, the supreme court of Missouri, division No. 1, says, is not so narrow as to conceive of, nor the eyes of the law so dim as to see, the relation of carrier and passenger only when a person is actually on board the car. To the contrary, the law deems that relation to exist when one may be, and treats one as a passenger who is, properly on the steps leaving the car, or properly on the steps entering a car, as a passenger. Again, the court says that, speaking generally, it may be said that where there is an implied invitation to enter a street car, arising from its stopping at a place required by ordinance for passengers to enter, or implied by its stopping at a place where it is customary for it to receive passengers, or implied from its stopping on the signal of one desiring to ride as a passenger, followed by an attempt to enter the car by placing a foot on the steps thereof, the relation of passenger and carrier is held by all the authorities to exist.

It was true, the court goes on to say, that the plaintiff saw no motorman or conductor; but, notwithstanding his failure to see either, a motorman acting in the dual capacity of motorman and conductor, or a motorman as well as a conductor—some operative belonging to the genus "homo sapiens"—was aboard and managing that car, unless it be assumed to have been moving under the (if the court may be allowed the word) unthinkable condition of running itself. When Crusoe saw human footprints on the sands of Juan Fernandez, and concluded therefrom that men had visited the isle, the soundness of his judgment is intuitively and spontaneously allowed by all his rational friends, schoolboy or grown. So here, when the act of stopping in response to a signal is conceived to be an act of human intelligence—footprints so to speak—the conclusion that a motorman was present is irresistible and conclusive. If present, he is presumed by the law to be at his post of duty, and further presumed by the law to be performing that duty.

Assuming, then, that the motorman was on the car, and giving effect to the testimony, to wit, that a signal was given for the car to stop and that it did stop, one of two conclusions, in the absence of evidence that it stopped for other purposes, irresistibly followed, viz: That the car had reached its usual place required by ordinance or by usage, for the entrance of passengers, and stopped on that account for them to enter, or that the motorman saw the signal, and, as a matter of grace in that particular instance, stopped to permit the would-be passenger to enter. Neither courts nor juries are permitted to cast to the winds their common sense, and the jury trying this case might naturally infer from a signal to stop and a stopping that the signal and the stopping place bore the relation of cause and effect; i. e., that the signal was seen, comprehended, and acted upon by those in charge of the car.

It might be that it would be well to have a statute requiring a litigant to disclose the names of all his witnesses to the opposite party precisely as he is now required to produce books, papers, and documents. In that event a corporate street railway defendant would be compelled, on application of an injured party, who may have been a stranger to every one present on the car, to arm such injured party with the names of all witnesses gathered by its skilled and industrious claim agents, and known to it, who were present and saw the transaction or could give any information—a valuable right, indeed, under circumstances easily to be imagined. But in the absence of any such law, equally applicable to both parties litigant, the court is not prepared to hold that a plaintiff who, out of caution or timidity, or say—selfishness, refuses to disclose the names of his witnesses to his opponent, thereby suffers the penalty of having his judgment set aside. In the present condition of the law the fact that a claimant concealed the names of his witnesses on application for them might, under proper circumstances and at the very utmost, go to the jury, for what it is worth on a question of good faith or a simulated claim, to be used later to point or feather an argument.

Care Required at Intersecting Streets and of Persons Crossing Tracks—Notice Charged by Law that Car May Pass at Any Moment.

Dean v. St. Louis Transit Co. (Mo.), 91 S. W. Rep. 505. Dec. 21, 1905.

It is true, the supreme court of Missouri, division No. 1, says, that greater care is required in the operation of street cars at intersecting streets, where passengers are usually discharged, and where cars meet and pass each other, than at other points between intersecting streets. It is likewise true that persons crossing railroad tracks at such points, or at any point, must exercise ordinary care to prevent accidents; for, especially in large cities, where street cars run at short intervals, the law charges every one with notice of the fact that a car may pass any given point at any minute, and therefore casts the duty upon persons crossing the tracks to exercise ordinary care not to go on, or over, or so near a track as to be injured by a passing train.

Frightening of Horses by Decorated Excursion Cars.

Joyce v. Exeter Hampton & Amesbury Street Railway Co. (Mass.), 76 N. E. Rep. 1054. Feb. 26, 1906.

A kind, gentle horse, not afraid of electric cars, which was standing in front of a store harnessed to a delivery wagon and secured by a rope attached to a 28-pound weight, was frightened and caused to run away by three cars carrying an excursion, following a regular car at distances of from 600 to 1,000 feet apart, which three cars were decorated with strips of white cotton cloth about a yard wide with the words "Butchers' & Grocers' Association of Nashua" printed thereon, one of these strips being over the dashboards and others along the sides of each of the excursion cars. Other witnesses testified that the cars were decorated with bunting, which was flopping with the motion of the cars and bulging in and out. The supreme judicial court of Massachusetts overrules exceptions to a judgment in favor of the plaintiff for injuries to the horse. It says that manifestly the question of the plaintiff's due care was for the jury. There was evidence of negligence on the part of the defendant. It ran its cars through a public street, decorated in a manner in which the jury might have found was likely to frighten horses, and did produce that result in this case.

The work of reconstructing the street railway lines in San Francisco is progressing rapidly. One track of the Sutter street line from Market street to Fillmore street has been completed. The railway company has laid a standard girder-rail track for two blocks on Post street for hauling debris.

NEWS SECTION

GENERAL NEWS OF THE MONTH

A Second Convention Bulletin.

A second and more complete announcement of the fall convention of the American Street & Interurban Railway Association has recently been distributed by Secretary Swenson. The report states that the choice of Columbus as a place of meeting was favorably received. The city has ample transportation facilities; eighteen steam railroads radiate from Columbus and 148 passenger trains enter and leave the city daily. Such cities as Chicago, New York, Philadelphia, Savannah, Memphis, St. Louis, Milwaukee, Toronto and Albany are within a comparatively short radius.

Regarding the hotel facilities at Columbus Secretary Swenson states that after investigation by committees of both the American and the Manufacturers' associations, it was determined that Columbus could not only accommodate the convention, but that the hotel facilities available at the present time are greater than those in a number of larger cities. The four leading hotels are the Chittenden, Neil, Hartman and Southern, all of which are under one management. These four hotels alone guarantee approximately 600 rooms while as many more will be available in several smaller high class hotels. The association headquarters will be at the fair grounds, but it is probable that the general place of meeting will be at the Southern Hotel where the annual banquet will be held. It is planned to make the Hartman the headquarters for the ladies. It is highly desirable that hotel reservations be made immediately. Those desiring reservations should communicate with B. H. Harmon, secretary of the convention committee, Columbus Board of Trade, Columbus, O., stating the nature of the reservations desired and the number of ladies in the party. The hotel rates on the American plan will be $2.00 per day and upward and on the European plan $1.00 per day and upward.

A committee from the manufacturers' association has already visited Columbus and arrangements are going forward for a comprehensive exhibit of street railway apparatus and appliances. The available floor space at the fair grounds in Columbus is nearly double that occupied in Philadelphia last year and the plans for the Columbus exhibition are therefore much more elaborate than those of 1905.

President Ely has appointed a convention committee which is representative of the section of the country of which Columbus is the centre. The following compose this committee; E. K. Stewart, chairman, general manager Columbus Railway & Light Company; F. A. Davis, president Scioto Valley Traction Company, Columbus; J. L. Adams, general manager Columbus, London & Springfield Railway Company; H. P. Clegg, president Dayton & Troy Electric Railway Company; E. C. Spring, president Central Electric Railway Association, West Milton, O.; J. B. Foraker, vice-president Cincinnati Traction Company; J. J. Stanley, general manager Cleveland Electric Railway Company; J. D. Callery, president Pittsburg Railways Company; C. L. Henry, president Indianapolis & Cincinnati Traction Company, and F. W. Brooks, general manager Detroit United Railway Company.

The meetings of the American association will be held on Wednesday, Thursday and Friday of the convention week, both morning and afternoon. The Accountants' association and the Engineering association will meet on Monday and Tuesday and Wednesday afternoons. The meetings of the Claim Agents' association will be held on Thursday and Friday. This arrangement will permit all delegates to attend the opening session of the parent association on Wednesday morning when short addresses will be given by representatives of the various associations.

The new bulletin includes a good map of the city of Columbus. Secretary Swenson announces that a more detailed map of the business centre of Columbus will be sent to the members of the various associations in a later bulletin.

Rapid Transit Commission Vetoes New York Elevated Plans.

The board of rapid transit commissioners of New York City, after a hearing on June 29 on the question of permitting a third track to be added to the Second and Third avenue branches of the elevated railroad system, voted unanimously to refuse the franchise. Opposition to the additional trackage was probably chiefly due to the fear that permanent extensions or improvements of the elevated structure would hinder the development of a comprehensive scheme of subways by which it is hoped, if not eventually to free the streets of elevated structures, at least to prevent any growth in this method of city transit. Representatives of various public organizations, including the Merchants' Association, the Municipal Art Society, the City Club, as well as Health Commissioner Darlington, were present at the hearing to protest against a granting of the privilege. The plan for the increased facilities was made largely through the activities of citizens and representatives of various improvement associations of the Bronx, who urged that the franchise be granted as a means of relieving the intolerable traffic congestion from which that section suffers.

The Interborough Rapid Transit Company made application about two years ago for a franchise for third tracks in Second and Third avenues, but the commission laid the matter aside until the subject was again brought to its attention by a recommendation of the state railroad commissioners, which body, upon complaint of residents in the Bronx, conducted an investigation and suggested to the Interborough Company and the Rapid Transit Commission the following plan:

1. That the Interborough Rapid Transit Company, operating the Manhattan Railway, extend the spur of the elevated structure now ending near the junction of Willis avenue and 145th street through Willis avenue to Bergen avenue to Winchester avenue, there connecting with the tracks of the elevated extension of the subway system.

2. That a third track be placed on the Second and Third avenue lines from the Harlem river as far south as practicable.

3. That additional track or tracks be constructed from 129th street north to Bedford Park.

4. That when the above mentioned tracks are constructed an express service shall be installed on the Second and Third avenue lines, which shall be operated during the entire day, a portion of which trains shall be operated to and from West Farms.

The board suggests to the Interborough Rapid Transit Company that it institute an express service to be operated all day between West Farms and the City Hall via the subway.

The elevated structure in Third avenue was originally built on a plan that would make it easy to add a third track, and the Interborough Company already has such a track from 42d to 129th street, and the laying of a third track from 9th to 42d street would necessitate only the placing of longitudinal girders, transverse girders already being in place. The city takes the position that this third track was surreptitiously laid, while the company believes it acted wholly within its rights under existing franchises. There appears a possibility that proceedings will be started by the city to prevent the Interborough company from using the third track now laid. The application for a third track franchise was not attended by any suggestion as to the exact amount of compensation to be paid to the city or the length of time of the franchise, although it was well understood that the company would not make a large expenditure with a prospect of securing a franchise for a very limited period. As a matter of fact the Second and Third avenue lines are now operated practically at their maximum capacity. The proposed east side subway system cannot in any event be ready for operation within five years and, in the meantime, the Interborough company and the residents of the Bronx believe that the refusal of the Rapid Transit Commissioners to permit a logical increase in the capacity of the present elevated facilities will work a hardship on that section, particularly in view of the rapid increase in population.

Traction Developments in Cleveland.

Mayor Johnson's plans for giving the people of Cleveland, O., a 3-cent fare street railway system have recently assumed a somewhat definite shape. A new company, known as the Municipal Traction Company, has been organized as a holding company to take over the Forest City Street Railway Company, the so-called 3-cent fare system. The Municipal Traction Company is incorporated with a capital stock of $10,000. The names of the five trustees, who will also act as a board of directors for the holding company, have been announced and are as follows:

A. B. Du Pont, formerly consulting engineer of the Detroit United Railway, Detroit, Mich., president; Edward Wiebenson, secretary-treasurer of the United Banking & Savings Company; F. C. Howe, lawyer; Charles W. Stage, county solicitor, and William Grief, president of the Grief Brothers' Company.

At the time of the incorporation of the holding company the capital stock of the Forest City company was increased from $250,000 to $2,000,000. The property which the Forest City company will turn over to the holding company consists of five miles of track already constructed and nine miles under construction.

In his statement regarding the plans of the new company Mayor Johnson says that $700,000 of the increased capital stock of the Forest City company will be issued at once, the proceeds to be used by the Municipal company in the completion of the low-fare system and the purchase of rolling stock. The cost of building the line will be $50,000 per mile. The purpose of the new company will not be for profit, but rather to act as an intermediary between the public on one side and the railway company on the other. The remaining $1,300,000 of the Forest City railway stock will be issued and sold as needed from time to time and the proceeds applied to new construction.

The terms of the agreement by which the Municipal Traction Company takes over the Forest City company provide that the issue of the $700,000 of common stock shall be at 90 cents on the dollar and bear six per cent cumulative dividends at par; that all stock so sold and all stock already sold shall be subject to an option of purchase by the Municipal company or by the city of Cleveland at $1.10 and accumulated dividends; that all proceeds from the sale of stock of the Forest City company shall be expended in the construction and operation of this company; that at such a time as it may be empowered by law, the city of Cleveland may take over the Forest City system for municipal ownership and operation, and that the Municipal Traction Company shall be required to pay all operating and other expenses of the Forest City to pay all operating and other expenses of the Forest City company. Work is being pushed in the laying of track and pavement by the Forest City company. Extensions to all parts of the city will be sought without delay and new construction will be pushed with all speed. On Sunday, June 24, the company laid over 1,500 feet of track in Marcelline avenue, haste being thought necessary to avoid legal interference. Options on several sites for the power house and car barns have been secured.

The progress of the plans of the Forest City company has probably placed a stop to the project of leasing the Cleveland

Electric Railway Company to a company controlled by the city. At a recent conference between President Andrews and Mayor Johnson no decision was reached, the mayor declining to entertain a price of $85 a share for the stock. It is reported that the Cleveland Electric has received a proposition from Henry Everett and his associates for taking over the road under a long term lease. It is believed in some quarters that a lease to the Everett syndicate would mean the final settlement of the franchise troubles that have been so numerous in Cleveland.

Parcel Freight Ordinance Defeated.—The Chicago city council on June 25 defeated an ordinance permitting the Metropolitan West Side Elevated Railway to carry parcel freight.

New Transfer System.—The Brooklyn Rapid Transit Company on July 7 inaugurated a system of issuing transfers through agents stationed on the sidewalks at important crossings instead of through the conductors.

Detroit (Mich.) United Railway.—This company is renting summer cars for advertising purposes. The cars are fitted with electric signs advertising various resorts about the city and are rented by the hour. The company has arranged to operate through cars between Toledo and Mt. Clemens at an early date.

New Limited Service Between Cleveland & Toledo.—The Lake Shore Electric on June 21 put into service two new limited trains between Cleveland and Toledo. This makes five through trains each way daily, beginning at 7:30 a. m. and running every three hours. This limited service will be handled by new equipment in a few weeks.

Twin City Trolley Trips.—An attractive illustrated folder has been issued by the Twin City Rapid Transit Company which bears the title of "Twin City Trolley Trips." The folder contains maps and well-written, illustrated descriptions of the routes of the various lines and of the parks and other localities reached. The chief feature of the folder is a panoramic view in colors, 30 inches long, of all the company's lines.

Automobile Express Service.—The Aurora Elgin & Chicago Electric Railroad is preparing to take care of the express business between Aurora and Elgin. It has installed an automobile service in Aurora between the terminal station and the city limits. Twice each day the motor car makes the trip to the limits with express matter for the interurban express car. This service was only recently installed but it has proved very satisfactory.

Car Cleaning Methods of the Pittsburg Railways Company.—The Pittsburg Railways Company has recently adopted the method of cleaning all their cars by the vacuum system. Two cars have been fitted with vacuum pumps, operated by power from the trolley wires, and hose with a suitable nozzle, and travel from barn to barn. It is said that 100 cars can be cleaned in one night by this method and that the two cars do the work formerly performed by 50 car cleaners.

A New Insulator Pin.—In the description of the transmission line of the Long Island Railroad published in our issue of June, 1906, attention was called to the new type of iron insulator pin used. This pin is the invention of W. N. Smith of Westinghouse Church Kerr & Co., who has applied for a patent on the device. The design has been further improved and arrangements are now being made for manufacturing and placing it on the market, under the name of "The Smith-Grip Insulator Pin."

Interesting Literature of the East St. Louis & Suburban Railway.—A very creditable, illustrated booklet is being mailed by the East St. Louis & Southern Railway Company. The matter contained in it includes descriptions of the various points of interest reached by the line and how to get to them. Timetables for the lines are given and also the price of private cars from East St. Louis to points on the Alton Granite & St. Louis Company's lines. A map of the East St. Louis & Suburban lines is attached.

Five-Car Trains Over Brooklyn Bridge.—At the instigation of Chief Engineer Ingersoll, of the New York Department of Bridges, the Brooklyn Rapid Transit Company on June 27 began to operate 5-car trains over the Brooklyn bridge during rush hours, instead of 4-car trains as formerly. The experiment proved a success, greatly relieving the congestion of traffic. As soon as the extra cars are put on all the trains during the rush hour it is estimated that 9,000 more persons can be carried over the bridge per hour.

Question Box of the Claim Agents' Association.—The American Street & Interurban Railway Claim Agents' Association has recently started a question box the first copy of which has been distributed by Secretary Davis. Twenty-four questions are asked, all of which are of particular interest to claim agents. Since the questions and answers must be printed for distribution before the convention on October 15, Secretary Davis requests that answers to questions be mailed to him at 14 North High street, Columbus, O., not later than August 1.

Information Concerning Fraudulent Claim Operators.—Secretary B. B. Davis of the Claim Agents' association reports three men who attempted to work a fraudulent claim against the City Railway Company of Dayton, O., in April, 1906. They gave the names of John Hall, Rodney Hall and Earnest Carruth, but evaded arrest. On May 6, 1906, they had an alleged accident on the line of the Indianapolis Traction & Terminal Company, Indianapolis, Ind. Through the efforts of George Harvey, assistant claim agent for this company, two of these men, Walter Carruth, alias John Heydon, alias John Hall, and Earnest Carruth were arrested. On June 20, 1906, they were tried and convicted of felony and given an indefinite sentence in the penitentiary. It is reported that they also operated on the lines of the Lexington Railway Company, Lexington, Ky., the South Covington & Cincinnati Railway Company and the Cincinnati Traction Company.

Southern Michigan Railway Excursions to Chicago.—The excusion business from points on the Southern Michigan Railway to Chicago, via the Graham & Morton Transportation Company's steamboats has developed beyond expectations. The most popular excursions are from South Bend to Chicago, round trip $2.00 and from Berrien Springs to Chicago, round trip $1.50, tickets being good for fifteen days. This business is in competition with the Lake Shore & Michigan Southern steam road, whose one-way rate from South Bend to Chicago is $2.45.

City of Chicago Sues Elevated Railways.—The city of Chicago has brought suit against the Northwestern Elevated Railroad, the Lake Street Elevated Railway and the United Elevated Railway companies, in which the right of the "Union Loop" to exist is denied and the court asked to order the elevated stations and all extensions added since May 27, 1903, removed, on the ground that the Wabash avenue, Van Buren and Lake street portions of the loop were illegally erected because the consents of property-owners required by the law had been bought for $100 a front foot instead of being the free-will offering of the owners.

Argument on the Brooklyn Bridge Problem.—An argument on the problem of doing away with the congestion at the Brooklyn bridge terminals has recently been submitted to the commissioner of bridges for New York by Max E. Schmidt. The writer sets forth the existing conditions and suggests the use of moving platforms. He proposes to install a continuous train on the space of the bridge now occupied by the elevated tracks and to operate such a train at a constant speed of 10 or 12 miles per hour. It is further stated that this plan could be carried into effect and be in actual operation within 10 months after beginning work.

Single-Phase Electric Railway in London.—There is a project in London for the establishment of what is known as an outer circle railway. It is proposed to adopt the single-phase alternating system of electric traction. The starting point of the railway is to be at Feltham, in Middlesex, and this line will terminate at West Ham, in Essex. The total length of the line is to be slightly over 32 miles. It is proposed to build the line along a route which would place it close to stations of several existing railway companies, so that the former would act as a feeder to the latter and vice versa. The scheme is under the consideration of a committee.

Express Service on the Boston & Worcester Street Railway.—The Boston & Worcester Street Railway has petitioned the Massachusetts Railroad Commissioners for permission to run freight and express cars over its entire line between Boston and Worcester. Local grants have already been secured from all of the towns on the line. The cars planned to be used for this service are of the ordinary express pattern with double trucks, reinforced floors and vestibules at both ends. The company expects to inaugurate a separate freight and express department in charge of an experienced man. It is thought that the new business will be an important factor toward increased earnings.

Interline Tariff for Central Electric Railway Association.—John H. Merrill, secretary of the Central Electric Railway Association, is engaged in compiling for the various roads in the association, operating in Ohio, Indiana and Michigan, an interline tariff sheet which will show the rate between any two points in this district. The work is complicated by the fact that there are, in many cases, several routes which may be taken to reach the same point. At present Mr. Merrill will only undertake to compile a tariff showing the sum totals of the local rates without regard to competitive steam rates. The work is being taken from certain points, the Indianapolis district receiving the first attention.

The Boston & Northern and Old Colony Issue New Folders.—Some very attractive, illustrated folders have been issued by H. A. Faulkner, passenger agent of the Boston & Northern and Old Colony street railway companies. One of these folders describes the parks, groves and various seashore and other resorts on the lines of the two companies. Another gives the schedules, distances and fares on the various routes of the Old Colony system, with descriptions of some of the principal trips that may be taken. The third folder gives similar information for the Boston & Northern System. The three pamphlets are printed on buff tinted stock with brown ink. They bear appropriate cover designs which are gotten up in a pleasing and artistic manner. The folders are all well illustrated with reproductions of some of the famous old houses, picturesque lakes and views along the various lines.

Centralia & Central City Traction Company.—One of the latest companies to adopt electric in place of horse power is the Centralia & Central City Street Railway Company, of Centralia, Ill., a road 3½ miles long, serving the cities named. The company has been reorganized by St. Louis capitalists as the Centralia & Central City Traction Company and it is now announced that the reconstructed line will be opened for operation during the present month. Sixty-pound rails are used for the track work and the No. 000 trolley is supported by span wires. Power for the line is to be furnished by the Centralia Gas & Electric Company. The building formerly used as a horse barn has been remodeled into a car storage barn and repair shop. Three 30-foot single-truck cars have been purchased from the St. Louis Car Company and several of the old horse-cars will be repaired and used as trailers. The officers of the Centralia & Central City Traction Company are: J. D. P. Frances, St. Louis, president; H. M. Warner, Centralia, treasurer;

H. C. Blackwell, general manager. Mr. Blackwell has had charge of the construction work.

An Ingenious Attachment for Headlights.—W. W. Ruble of San Jose, Cal., has perfected a device which is known as an automatic headlight attachment. The principal fault to be found with the present arrangement of headlights is that in passing around curves the light shoots off at a tangent and fails to illuminate the track. By means of this device the light is made to turn in such a way as to be always upon the track. A stiff rod is attached to the running gear of the car. This rod passes through one end of a long link, the other end of which is connected with the light. The light is placed in a movable base and as the car enters a curve the turning of the running gear communicates with the light through this mechanism, making it follow the curve.

Recommendations for the New York Subway.—With a view to preventing the recurrence of the fire in the New York subway, which occurred on June 1, as described in the June number of the Street Railway Review, page 320, Chief Engineer George S. Rice has made the following recommendations to the Rapid Transit Commission:—

1. No parts of cars used in subway service should be constructed of inflammable material.
2. An adequate fire-line service should be installed throughout the whole subway so that water can be had at interior points.
3. Means should be provided for quickly removing smoke from the subway in such emergencies.

New York Elevated Lines Not Responsible for Damages to Easements After Twenty Years.—Judge Vann of the court of appeals of New York has reversed the decision of the lower courts in an action brought by an owner of property on Sixth avenue against the Manhattan Elevated Railway for damages to easements through the operation of the road, and has decided that as the elevated road south of the Harlem river was constructed and put in operation between June, 1878, and August, 1880, the abutting property owners are debarred under the statute of limitations from recovering damages now, after 20 years The court held that the fact that in various tax petitions the company had admitted its liability for damages and had settled with property owners similarly situated, was irrevelant, there being no privity between the plaintiff and other owners.

Chicago & Joliet Organizes a Benefit Association.—The Chicago & Joliet Electric Railway Company will soon complete the organization of an employes' benefit association. A two-story stone building occupying a floor space of 50x80 feet has been provided for use as a clubhouse. This building adjoins the general offices and interurban terminal. The first floor of the house is fitted with shower and tub baths. One-half of the second story is a gymnasium and the remaining half is reserved for pool and billiard tables and a reading room. A fee of 25 cents a month, payable in advance, is charged for membership to the club. The Chicago & Joliet is improving its Dellwood Park, a tract of about 60 acres. A large pavilion for concerts and dancing, artificial lakes and a number of underground passages are being built. During the summer excursion trains will be run from Chicago and Joliet to the park.

Work of the Committee on Municipal Ownership.—At the 1905 convention of the American Street & Interurban Railway Association the president of the association was authorized to appoint a committee on municipal ownership whose duties would be to make a general investigation of this problem and to report at the 1906 convention. It will be the committee's endeavor to present as the main feature of its report the present status of municipal ownership in the United States with reference to the properties of the corporations represented in the association. To this end the committee has distributed to the general managers of the electric railway properties in America a 4-page information blank, containing a list of questions bearing on the subject of municipal ownership. It is requested that this form when properly filled out be returned to the secretary of the association, Bernard V. Swenson, 60 Wall street, New York City, together with any additional suggestions and information that it may be desired to place before the committee.

Denver Rejects Municipal Ownership.—Municipal ownership does not seem to be an attractive proposition to the tax-paying voters of Denver, Colo. The principal question involved in the spring election held in that city was whether the city should grant certain public service franchises or try municipal ownership. The Democratic and Republican parties favored the extension of existing franchises. A new party known as the Municipal Ownership party was organized and offered an independent ticket. A franchise was asked in the name of the Municipal Traction Company for the operation of a street railway on various streets in Denver, including much of the territory now covered by the Denver City Tramway Company. This franchise was backed by certain politicians who were connected with the Municipal Ownership party. It was planned by them that if the franchise was granted, the Denver Tramway Company would be obliged to either sell its holdings by reason of the lapse of its existing franchises, or to purchase the new franchise at an excessive value. These plans, however, were defeated. The Denver City Tramway Company asked for a 20-year extension of its present franchises, some of which will expire in about 14 years, and for the right to build some 80 miles of extensions at the rate of at least 10 miles per year. In return the company agreed to pay into the city treasury the sum of $1,200,000 to be used in the improvement of the boulevards and parks and to be in lieu of all license tax on cars. The company also agreed to extend at its own cost certain viaducts of the city and to pave the streets between and for two feet on each side of its tracks and to keep the tracks in repair. These measures were carried by a considerable majority. A franchise was also granted to the Denver Gas & Electric Company to lay gas pipes and erect electric light poles.

Outing of the New England Street Railway Club.—The New England Street Railway Club had a very enjoyable outing at Salisbury Beach, Mass., on June 28. The party left Boston at 9:30 a. m. in special cars over the Boston & Maine Railroad for Newburyport. From Newburyport the excursionists were taken to Salisbury Beach in special cars of the Haverhill & Amesbury Street Railway Company. At noon a fish dinner was served at the Hotel Cushing. In the afternoon the club was taken to Black Rocks at the mouth of the Merrimac river, returning to Boston at 6:45 p. m.

Canadian Street Railway Association.—The semi-annual meeting of the Canadian Street Railway Association was held at the Chateau Frontenac, Quebec, the first week in June. W. G. Ross, of Montreal, presided and the following companies were represented: London Street Railway, Southwestern Traction Company of London, Niagara St. Catharines & Toronto, Toronto Railway, Toronto & York Radial, Toronto Suburban Railway, Montreal Street Railway, Quebec Street Railway, Halifax Street Railway and St. John Street Railway. Papers were read by Mr. M. Neilson, consulting engineer Montreal Street Railway, on "Track Construction and Maintenance" and by Mr. G. C. Royce, manager Toronto Suburban Railway, on "Gasoline-Operated Motor Cars."

Traction Affairs in Lincoln, Neb.—Street railway affairs in Lincoln, Neb., have been in an unsettled condition for some time. Some time ago the Lincoln Traction Company acquired by foreclosure sale certain property of the Lincoln Street Railway Company and the right, so far as the court could grant it, to operate a street railway in certain specified streets which it proceeded to occupy at once. The claim was made by the city that the new company since the purchase has conducted operations in an arbitrary manner and has paid no heed to the interests of the public. The poor service resulted in a public meeting held a little less than two years ago at which a third company, the Citizens' Railway Company, was organized. The organizers included prominent business men of the city and every citizen of Lincoln was invited to take stock. The purpose of the Citizens' company was to get for the people better service and if necessary to construct and operate a street railway system in the interests of the city.

After organization the proceedings were discontinued in the hope that the operating company would meet the demands of the public. However, the wishes of the people were not gratified, so the Citizens Railway Company started construction on one of the neglected streets of the city. The traction company immediately instituted injunction suits to delay the Citizens company and prepared to do some building on its own account on streets paralleling the tracks of the new company. The question of the right of the Lincoln Traction Company to streets not previously occupied by it was then brought up. In settlement of the point the city attorney began suit to prevent the occupation of other streets by the traction company until its right thereto has been established by the courts. The controversy is now in the hands of the courts which will pass upon the claim of the traction company and the validity of its franchises.

Anti-Merger Legislation in Massachusetts.—The so-called "merger bill" giving Massachusetts railroad corporations the right to acquire electric railroads in the state, which has been before the legislature for two years, was defeated in the Massachusetts House of Representatives on June 20 by a majority of 3 to 1. The defeat of the merger bill was immediately followed by the introduction of four "anti-merger" bills directed mainly against the New York New Haven & Hartford Railroad, which, through the medium of a holding corporation, the Consolidated Railway Company, owns or controls several street railway companies within the state. These bills, two of which prohibit foreign railroad corporations from owning or acquiring directly or indirectly, any interest in Massachusetts street railways, and two of which prohibit any railroad corporation from owning or acquiring street railway property in the state, were all referred to the committees on railroads and street railways meeting in joint session. After a long discussion in which the committee was addressed at length by President Mellen and Attorney Charles F. Choate of the New York New Haven & Hartford, and others, on June 28 a bill was reported directing Attorney General Malone to test before the supreme court of the state the legality of the control of street railways by railroad corporations, and forbidding the acquisition of street railway properties by railroad corporations pending the decision of the supreme court. After a long discussion the report of the joint committee was rejected by the House and a bill drafted by Speaker Cole substituted and passed by a 2 to 1 vote. The bill absolutely prohibits railroad corporations from controlling street railways in Massachusetts and provides that railroad corporations must dispose of their street railway holdings within six months after its passage. The senate, however, refused to pass the Cole bill, and amended it by substituting the bill reported by the joint committee. Thereupon both the House and the Senate appointed conference committees, but no agreement was reached and second conference committees were appointed. When it became evident that no agreement between the House and the Senate could be reached during this already long drawn-out session the legislature was prorogued on June 29.

PERSONAL MENTION

Mr. W. R. Abbott has resigned as president of the Fort Smith Light & Traction Company, of Fort Smith, Ark.

Mr. John M. Osborn has been appointed assistant general freight and passenger agent of the Toledo Port Clinton & Lakeside Railway, with office at Toledo, O.

Mr. W. E. Erwin of Los Angeles, Cal., has been appointed to succeed Mr. O. D. Collins as superintendent of the San Bernardino Valley Traction Company.

Mr. Charles H. Dalton has tendered his resignation as a member of the Boston Rapid Transit Commission, to take effect as soon as his successor can be appointed.

Mr. G. H. Murch, manager of the Atlantic Shore Line before it absorbed the Portsmouth Dover & York Street Railway, has been appointed superintendent of the eastern division.

Mr. Joseph G. Ray has been elected treasurer and general manager of the Milford Attleboro & Woonsocket Street Railway, with office at Franklin, Mass., succeeding E. K. Ray, deceased.

Mr. D. A. Munger has been appointed general agent of the traffic department of the Los Angeles Pacific Railway and the Los Angeles Interurban Railway, with office at Los Angeles, Cal.

Mr. James B. McQueeney has been appointed general freight agent of the Brooklyn Rapid Transit Company, at Brooklyn, N. Y. Mr. McQueeney has been acting general freight agent since April 1.

Mr. Julian Griggs, heretofore assistant engineer of the Norfolk & Western Railway, at Norfolk, Va., has been appointed chief engineer of the Scioto Valley Traction Company, of Columbus, Ohio.

Louis Cassier, of New York, publisher of "Cassier's Magazine" and "The Electrical Age," was killed in a railroad accident on the London & Southwestern Railroad at Salisbury, England, on July 1.

Mr. Eugene D. Martinez, for the last five years electrical engineer of the Houston Electric Company at Houston, Tex., has resigned to accept a position with the Memphis (Tenn.) Street Railway.

Mr. C. W. McCabe, recently with the Ft. Wayne & Wabash Valley Traction Company, has been appointed passenger and freight agent at Fort Wayne, Ind., for the Toledo & Chicago Interurban Railway.

Mr. A. M. Grantham, heretofore purchasing agent of the Toronto Railway and the Toronto & York Radial Railway, of Toronto, Ont., has been appointed superintendent of construction of both companies.

Mr. D. H. Reynolds was re-elected president of the Cumberland & Westernport Electric Railway at a recent meeting of the stockholders held at Cumberland, Md. Mr. D. P. Hartzell was re-elected secretary and treasurer.

Mr. O. F. Prior has recently been appointed master mechanic at Danville, Ill., for the Illinois Traction System. He succeeds Mr. George Voigt, who has accepted a position with the Allis-Chalmers Company at Milwaukee, Wis.

Mr. Herbert McNulta, heretofore manager of the Electric Railway & Light Department of the Anaconda Copper Mining Company, at Anaconda, Mont., has been appointed chief engineer of the Cincinnati Traction Company, of Cincinnati, O.

Mr. W. F. Gorenflo was elected to the newly created office of general superintendent of the Gulfport & Mississippi Coast Traction Company at a recent meeting of the stockholders of the company. His headquarters will be in Gulfport, Miss.

Mr. E. M. White has been elected treasurer and auditor of the Birmingham Railway Light & Power Company, of Birmingham, Ala., succeeding Mr. C. M. Cory, resigned. Mr. E. C. Jolly has been elected assistant secretary and assistant treasurer in place of Mr. White.

Mr. Richard Meriweather has been appointed superintendent of the Louisville & Eastern Railroad. Mr. Meriweather will have charge of the road as at present in operation from Louisville to Beards and will superintend the work of construction of its lines from Beards to Frankfort.

Mr. F. J. Wheeler has been appointed general passenger and freight agent of the Schoepf-McGowan electric railway lines in Indiana, with headquarters at Indianapolis. Mr. Walter Hurd has been appointed to a similar position for the Ohio lines, with headquarters at Columbus.

Professor Mortimer E. Cooley, dean of the department of engineering of the University of Michigan, has been retained by the city of Chicago as special traction adviser, to co-operate with Mr. Bion J. Arnold and Mr. A. B. Dupont in ascertaining the value of the street railway properties.

Mr. Thomas M. Keeley has resigned as assistant general superintendent of the Michigan United Railways. Mr. Keeley was formerly superintendent and electrical engineer of the Michigan Traction Company, of Kalamazoo, Mich., before that company was taken over by the Michigan United Railways.

Mr. Calvin W. Rice, who has been consulting engineer of the New York office of the General Electric Company since 1904, has been elected secretary of the American Society of Mechanical Engineers and assumed office July 1. Mr. Rice is also a member of the American Institute of Electrical Engineers, the Institution of Electrical Engineers of Great Britain and the American Association of the Advancement of Science.

Mr. Frank C. Sykes has resigned as assistant engineer of the United Railroads of San Francisco, Cal.

Mr. Thomas Martin, of Chelsea, Mass., has been appointed general manager of the Woonsocket (R. I.) Street Railway, succeeding the late Edgar K. Ray.

Mr. J. S. Cousins has been appointed superintendent of the New London & East Lyme Street Railway, of New London, Conn., succeeding Mr. Lorenzo Bently, resigned.

Mr. L. J. Schlesinger, formerly general superintendent of the Muncie Hartford & Ft. Wayne Railway, has been made superintendent of motive power for the entire system of the Indiana Union Traction Company.

Mr. D. A. Lavenburg has been made general manager of the Ohio Central Traction Company. Mr. Lavenburg was formerly superintendent of the Northern Texas Traction Company and more recently acted in the same capacity for the Toledo & Indiana Railway. His new headquarters are at Galion, O.

Mr. Thomas Wood of Champaign, Ill., has been appointed superintendent of the Illinois Traction Company's interurban lines between Springfield and St. Louis. He will have control of 117 miles of track. Mr. Wood's headquarters will be at Staunton, Ill. He has been in the employ of the McKinley syndicate for the past 11 years.

Mr. C. M. Paxton has been appointed general manager of the Dayton & Troy Electric Railway, the Troy Tippecanoe & Dayton Interurban Railway, the Miami Valley Railway and the Pique Street Railway, with headquarters at Tippecanoe City, O. Mr. Paxton has heretofore been secretary and traffic manager of the lines named.

Mr. N. A. Christensen.

Mr. N. A. Christensen has been appointed consulting engineer of the Allis-Chalmers Company, which states that it has purchased the exclusive rights to manufacture and sell the Christensen air brakes and air compressors and that one of the company's shops is being fitted with a mechanical plant of original design for the construction of Christensen air brakes and compressors. Mr. Christensen was born in Denmark in 1865, where he attended the public school until 14 years of age, entering the polytechnic institute at Copenhagen at the age of 18. His work in that city included the designing and installing of a steam boiler plant, steam engines, electric lighting plant and complete air compressor plant in what was then the largest lighthouse in the world. Mr. Christensen made the first rapid firing Maxim gun built outside of England and America. He also assisted in designing and completing several ships for the Danish and Russian governments. At the age of 23 he secured employment in London, where he designed the machinery and made the general plans for the new water works at Calcutta, as well as a variety of other work. At the age of 26 he came to the United States as designer of Corliss engines for the Fraser & Chalmers Company, Chicago. The Christensen Engineering Company was organized in Milwaukee in 1897 and grew rapidly, until the sales of air brakes in 1904 aggregated nearly $1,300,000. In the fall of 1902, against the judgment of Mr. Christensen, who was not a stockholder of the company, it was decided to broaden the scope of the business and include general electrical manufactures. This led to his retirement as general superintendent, and the company was later merged in a new corporation known as the National Electric Company. Mr. Christensen then engaged in the construction of air compressors and other articles, leaving to the other company the making of air brakes for electric cars under his patents, he receiving a royalty for their use. The National Electric Company had a receiver appointed in the spring of 1905 and has since been succeeded by the National Brake & Electric Company, as already reported in our columns.

Mr. William Luxton has resigned as superintendent of the Canton-Akron Railway. Mr. D. A. Scanlon has been appointed division superintendent of the Canton-Akron city division. Mr. William E. Rolston has been promoted to be master mechanic of the Canton-Akron, Canton-New Philadelphia and Tuscarawas traction companies.

Mr. E. B. Taylor, superintendent of the Detroit city lines of the Detroit United Railway, has been appointed superintendent of the Detroit Monroe & Toledo Short Line, with headquarters at Detroit, Mich., succeeding Mr. W. B. Tarkington, resigned. Mr. Murdock McCauley has been appointed to the newly created position of assistant superintendent of the Short Line, with office at Monroe, Mich.

CONSTRUCTION

TRACK AND ROADWAY.

Portland Railway.—It is reported that this company will spend $350,000 in relaying and building new tracks in Portland, Ore.

Consolidated Railway.—Plans and estimates are being prepared for building an electric road between Meriden and Middletown, Conn.

Youngstown Sharon Railway & Light Company.—It has been decided to build a branch at once to connect with the amusement park at Roseville, O.

Chicago & Southern Traction.—Work on this line from Chicago Heights to Kankakee, Ill., is being rapidly pushed. Grading crews are now working north of Steger.

York County (Pa.) Traction.—Surveys have been completed for the line from York to Hanover, Pa., via Spring Grove. A. H. Hayward, general manager, York, Pa.

Oklahoma City Railway.—It is reported that this company will soon extend its lines from Oklahoma City to Britton and Guthrie, Okla., and that work is to begin August 1.

Detroit United Railway.—This company is reported to be preparing to extend its system from Flint to Saginaw and Bay City, Mich., and from Royal Oak to Almont, Mich.

Reading & Hamburg Electric Railway.—Surveys are being made for a line to connect Reading and Hamburg, Pa., 18 miles, via Leesport, Shoemakersville and Mohrsville.

Rock River Traction (Prophetstown, Ill.)—Surveyors are at work locating a line between East Moline and Geneseo, Ill., and plans are being considered for a line to Sterling, Ill.

Portsmouth, N. H.—A company has been formed by Wm. E. Partington, of Rye, N. H., to build a trackless trolley line from Wentworth House, Portsmouth, to New Castle, N. H.

Evansville & Mt. Vernon Traction.—Traffic has been opened on this line which extends from Evansville to Mount Vernon, Ind., a distance of 17 miles. An express service is planned.

Montgomery County Rapid Transit.—The contract for the construction of this road from Norristown to Souderton, Pa., 17 miles, has been let to John Bane & Co. of Zanesville, O.

Campbelltown & Hummelstown Street Railway.—It is reported that this company will shortly begin work on the extension of its line to Campbelltown and thence to Palmyra, Pa., 8 miles.

West Chester Street Railway.—Superintendent E. W. Goss has begun work on the extension from Coatesville to Gallagherville, Pa. The road now extends from Westchester to Coatesville.

Spokane Traction.—This company has decided to begin work at once on an extension from Hatch and Webster Sts., in Spokane, Wash., to Altamont, a suburb of Spokane, about a mile.

Illinois Traction System.—The first car on the Clinton-Bloomington division of this system was run over the line on July 1. The overhead work is of the catenary type of construction.

Gainesville Whitesboro & Sherman Electric Interurban Railway.—It is reported that the construction work on a portion of this road has begun. G. A. Hassinger of New Orleans is president.

United Traction.—This company's extension in Albany, N. Y., will be started in a few days. Rails have been delivered along the route, in Madison Ave., Trinity Place, Broad St. and Second Ave.

Salt Lake & Ogden Electric Railway.—Seventy per cent of the grading from Washington Ave. in Salt Lake City to the Ogden canyon has been completed and the work is being pushed forward rapidly.

Pittsburg Railways Company.—Jas. D. Callery, president, is quoted as saying that a street railway system in Washington, Pa., and a line from Canonsburg to Pittsburg will be built this summer.

Mayfield & Columbus Railway.—Contracts will soon be let for the construction of this road from Mayfield to Columbus, Ky., 30 miles. P. Burnett, president; W. B. Stanfield, of Mayfield, chief engineer.

Greensboro & High Point Interurban Railway.—J. H. Dawes of Greensboro, N. C., chief engineer of this road, states that the contracts for its construction have been let. W. D. Pender, Norfolk, Va., is president.

Lake View Traction.—It is stated that contracts will be let shortly for the construction of this road from Memphis, Tenn., to Clarksdale, Miss., 77 miles. W. E. Willett, Memphis, Tenn., is general manager.

McMichael Street Railway.—This company, which owns the street railway system of Benton Harbor, Mich., will soon begin work on an extension to Kalamazoo, Mich. Right of way has nearly all been secured.

Southern Kansas Railway Light & Power Company.—R. C. Rawlings, president, Chanute, Kan., writes that this line will extend from Chanute, Kan., to Carthage, Mo., and Coffeyville, Kan., 170 miles, of which 26 are in Missouri and 144 in Kansas. The route is via Parsons, Columbus and Galena, Kan., Joplin, Webb City, Carterville and Carthage, Mo., and Cherryvale and Independence, Kan. Contracts for the entire construction are to be let July 15. J. W. T. Stephens, of Chanute, is chief engineer. The main power plant will be located at Chanute and substations at Independence and Coffeyville.

West Jersey & Seashore Railroad.—This line from Camden to Atlantic City, N. J., which has been equipped for electrical operation, has been practically completed. It is stated that it will be in operation by August 1.

Denver Greeley & Fort Collins Railway.—It is reported that J. D. Houseman of Denver, the promoter of this road from Denver to Fort Collins, Colo., 50 miles, has secured a 150-foot right of way for two-thirds of the distance.

Martinsburg Electric Company.—James F. Thompson, vice-president, states that contracts will be let at an early date for the construction of this line from Martinsburg to Harper's Ferry, via Charleston, W. Va., 80 miles.

Youngstown & Ohio River Railroad.—This company has advertised for contracts for the grading of that portion of the line between Washingtonville and West Point, O. The line is to connect Youngstown and East Liverpool.

Atlanta Buford & Garrettsville Railway.—It is announced that surveys have been made and right of way secured for this company's 80-mile line from Atlanta to Norcross and Gainesville, Ga. H. D. Jaquish of Gainesville is president.

Chambersburg Greencastle & Waynesboro Street Railway.—Bids have been asked for by this company for the grading of a portion of the proposed extension to Highfield and Monterey, Pa. This work will be done during the summer.

Pacific Electric Railway.—The entire right of way for the extension from Los Angeles to Covina, Cal., via Ramona and El Monte, 23 miles, has been secured and grading has been started. The line is to be completed within six months.

Chippewa Valley Electric Railroad. (Eau Claire, Wis.)—This company, which connects Eau Claire and Chippewa Falls, Wis., is securing right of way for an extension from Eau Claire to Menominee. O. H. Ingram, of Eau Claire, is president.

Ogden (Utah) Rapid Transit.—This company's line from Ogden to the mouth of Ogden Canyon has been opened for traffic, and it has been decided to begin work at once on an extension through the canyon to Hermitage, Idlewild and The Oaks.

Marion Bluffton & Eastern Traction.—This company, which is building from Marion to Bluffton, Ind., has laid track to within 6 miles of Bluffton, with the exception of a few short gaps. The Riggs & Sherman Company, of Toledo, are the contractors.

Benton Harbor St. Joseph Railway & Light Company.—It is reported that seven miles of this company's 20-mile line from Benton Harbor to Eau Claire, Mich., has been completed and it is expected that the remaining 13 miles will be completed by August 1.

Lake Shore Electric Railway.—This company has made surveys for an extension from Fremont to Fostoria, O. Plans have already been completed for the line from Sandusky to Fremont, and the new extension would give a connection with the Western Ohio.

Philadelphia & Western Railroad.—It is stated that this company will defer the opening of its line from Wayne, Pa., to Sixty-third and Market streets, Philadelphia, until the Philadelphia Rapid Transit Company completes its elevated connection to that point.

Buffalo Lockport & Rochester Electric Railway.—An official report states that 10 miles of grading, from Rochester to Adams Basin, N. Y., have been completed on this road which J. G. White & Co., of New York, is building from Rochester to Lockport, N. Y.

Lima & Toledo Traction.—It is announced that this line will be opened for traffic between Lima and Leipsic, O., on August 1, and that the entire line, with an independent entrance to Toledo will be completed by December 1. F. T. Hepburn, general manager, Lima, O.

Rochester Syracuse & Eastern Electric Railway.—This road was formally opened for traffic between Lyons to Macedon, N. Y., 18 miles on July 4. The line extends from Rochester to Syracuse and the section from Rochester to Lyons, 36 miles, was completed some time ago.

Springfield Clear Lake & Rochester Electric Railway—.The grading on this line from Springfield to Rochester, Ill., has been completed and it is expected to begin track-laying this week. The material has arrived and a force of men will be put to work at both ends of the line.

San Jose & Santa Clara Railroad.—This company, recently incorporated, proposes to reconstruct a line from Santa Clara to San Jose, Cal., 15 miles, and build a new line, 14 miles long, from San Jose to Alum Park. Contracts will be let shortly. L. E. Hanchett is president.

New Orleans & Baton Rouge Railroad.—This company, recently incorporated to build from New Orleans to Baton Rouge, La., has completed surveys and is engaged in securing right of way. It is stated that construction will begin in the fall. Edward Godschaux, of New Orleans, is president.

Anderson Traction Company.—Claude I. Dausen, secretary, Anderson, S. C., writes that 5 miles of grading have been completed between Anderson and Belton, and that the line will be extended to Greenville, S. C., 35 miles, through Belton, Williamston, Pelzer and Piedmont. W. O. Willard has the contract for the grading, Cambria Steel Company for the rails, J. G. Brill Company for the cars and trucks, General Electric Company for power and car equipments, and Virginia Bridge & Iron Company for the bridges. J. A. Brock, Anderson, is president; J. E. Sirrene, Greenville, is chief engineer.

Spokane-Pend d'Oreille Rapid Transit.—Practically all the right of way from Spokane to Lake Pend d'Oreille, Wash., 46 miles, has been secured and several construction crews will be put to work shortly at different points along the route. C. H. Reeves, Spokane, Wash., is president.

Mahoning & Shenango Valley Traction.—It is reported that this company will let contracts in the near future for the building of the connecting link between its line and that of the Eastern Ohio Traction Company. The line will extend from Leavittsburg to Garrettsville, O., a distance of 13 miles.

New Subways for New York.—The board of estimate of New York City has adopted resolutions asking the Rapid Transit Commission to consider at once a continuous system of subway routes between the boroughs of Brooklyn, Manhattan, the Bronx and Queens, with provision for future extensions.

Kent Traction Company.—This company, recently incorporated, has secured nearly all of its right of way for a line between Tolchester and Chestertown, in Kent county, Maryland. As soon as about one-quarter mile more of the right of way is obtained contracts for the construction will be let.

Atlanta Macon & Griffin Interurban Railway.—The Georgia Securities Company has been organized with a capital stock of $100,000 to do the active work of building this road from Atlanta to Macon, Ga., 88 miles, and a contract has been let to the N. P. Pratt Engineering Company for making the surveys and estimates.

Indianapolis & Cincinnati Traction.—The Kinser Construction Company, Chicago, has the contract for extending this line from Rushville to Connersville, Ind., 17 miles. The road is now in operation from Indianapolis to Rushville, 40 miles. Part of the grading has been sublet to the Inland Construction Company, Chicago.

Portland & Seattle Railway.—This company, which intends to build a road from Portland to Tacoma and Seattle, Wash., has acquired the old grade of the Portland & Puget Sound and work has been started between Portland and Chehalis. President C. M. Levey is quoted as saying that the road will be operated by electricity.

Tidewater Development Company.—The Roberts & Abbott Company of Cleveland, O., has been awarded the contract for the engineering on this company's proposed line from Gadsden to Tuskaloosa, Ala. Surveys will begin about July 1 and construction will begin in the fall. J. M. Dewberry, Birmingham, Ala., is president.

Philadelphia Rapid Transit.—It is reported that work on the Delaware avenue section of the subway, from Arch to South streets wil be begun within two weeks and that contracts will be let for the foundations. Plans are being prepared for an extension from Sixty-third street, Philadelphia, through the towns of Upper Darby and Lansdowne, Pa.

Illinois Traction System.—The contract for grading and most of the bridge work between Decatur and Monticello on the line from Decatur to Champaign, Ill., has been let to Tuttle Brothers, of Decatur, who also had the contract for grading between Bloomington and Morton.—On July 4 the line between Bloomington and Decatur was opened for traffic.

Oskaloosa & Buxton Street Railway.—The Engineering & Investment Company of Pittsburg, Pa., has the contract for the construction of the first 2½ miles of this road from Oskaloosa to Buxton, Ia., and has advertised for bids on grading and ties to be opened July 6 at Oskaloosa. Contracts for the remaining 16 miles of the road will be made later.

Hamilton Waterloo & Guelph Railway.—Bids will be received on or before July 27 for the construction of an electric railway between Hamilton and Galt and Hamilton and Guelph, Ont., a total length of about 60 miles. Plans and specifications may be seen at the office of Thomas E. Hillman, C. E., Hamilton Provident & Loan building, Hamilton, Ont.

Twin City Rapid Transit.—We are officially advised that this company plans to build a tunnel through the Selby avenue hill in St. Paul, Minn., for its street railway tracks, in order to avoid the 16 per cent grade which now exists and to do away with the present counterweight system of taking the cars up the hill. Plans are not yet complete, but the work will probably be started next winter.

Roanoke & Salem Traction Company.—It is reported that the promoters of this road, recently incorporated to build from Roanoke to Salem, Va., will begin work in about 60 days and that most of the right of way has been secured. An option has been secured on a 35-acre tract of land on the Roanoke River, where an up to date amusement park will be built. O. L. Stearnes, Salem, Va., is president.

Inland Empire Railway.—F. A. Blackwell is quoted as having stated that the Inland Empire Railway Company expects to have an electric line in operation to Lake Pend d'Oreille, Idaho, within a year. It has been the purpose of the Inland Empire for some time to extend its line from Coeur d' Alene, Idaho, to Lake Pend d' Oreille and it is expected that the extension will be completed for the opening of the summer season next year. The distance from Coeur d' Alene will be about 24 miles and from Spokane about 56 miles. The through trip will be made in 1 hour and 45 minutes.

Lewiston & Southeastern Electric Railway.—It is stated that financial backing has been secured, conditional on reports of engineers who are now at work looking over the line, for building this road from Lewiston to Grangeville and Nez Perce, Idaho, 110 miles. The road is to be operated by steam until the whole line is completed, when electricity is to be used. G. W. Thompson, of Lewiston, is president.

Detroit Saginaw & Grand Rapids Electric Railway.—E. P. Sherman, president, Saginaw, Mich., writes that this company proposes to build an electric motor road 200 miles long connecting Detroit and Grand Rapids, Mich., and that grading is to begin at an early date. Officers: J. S. Smart, vice-president; W. T. Naldrett, treasurer; J. P. Gibbs, secretary; H. Farnham, chief engineer. Headquarters, Saginaw, Mich.

Northern Electric Company.—C. S. Compton, chief engineer, Chico, Cal., writes that 26 miles of track have been laid this year, from Chico to Oroville, Cal., and that grading is in progress from Oroville to Sacramento, 68 miles. R. A. Moncure, Oakland, Cal., has the contract. The maximum grade will be .5 per cent, maximum curvature 2 degrees, except in cities. Sixty-pound rails will be used, and both freight and passengers will be carried. H. A. Butters, president, Oakland, Cal.

Long Island Railroad.—Among the many improvements which this company is making in the way of straightening tracks and revising grades is the building of a new 4-track line about a mile and a half long in the town of Newtown, L. I., from the junction of the New York Woodhaven & Rockaway division and the Montauk division at Glendale Junction north to a connection with the main line. This connecting link is necessary to give the Montauk division and the Rockaway Beach lines an entrance by a direct route to the Pennsylvania tunnel at Long Island City.

Buffalo Lockport & Rochester Electric Railway.—J. G. White & Co. of New York, who have the contract for building this road from Rochester to Lockport, N. Y., have announced the appointment of the following officers and engineers in charge of the work: C. G. Young, construction manager; W. H. Swain, assistant general superintendent, at the New York office; J. D. Evans, superintendent of the first division, Rochester to Albion; Paul Iglehart, superintendent of the second division, Albion to Lockport; J. F. Tuthill, chief of surveys. The headquarters will be located at Albion, N. Y.

Buffalo Lake Erie & Niagara Railway.—This company has been organized to build a connecting railroad around the city of Buffalo and to Tonawanda, N. Y., passing through West Seneca, Hamburg, Cheektowaga and Amherst, about 36 miles. The work will include about 3,000,000 cubic yards of embankments and 500,000 cubic yards of cuts. There will be 14 railroad bridges and 37 highway bridges. Contracts are to be let as soon as a certificate has been granted by the New York Board of Railroad Commissioners, Edward Michael, president; C. C. Conkling, chief engineer, Buffalo, N. Y.

OVERHEAD WORK.

Chicago City Railway.—It has been announced that the State St. cable line will be equipped for trolley operation by August 1. The Cottage Grove Ave. line will not be ready for electricity before the end of the year as it will be necessary to equip a substation first.

Chicago Union Traction.—The work of equipping this company's lines for electricity under the terms of the recent city ordinance was begun June 26, when poles for trolley wires were placed in Adams street between State street and Fifth avenue, and wires were strung at once. The greater part of the work converting the lines in the loop district has been completed.

Guanajuato Power & Electric Company, Guanajuato, Mexico, which now owns 110 miles of main transmission line, operated at 60,000 volts, with 15,000 volt secondary lines to various mines, is making several improvements and will build 60 additional miles of line. The present line consists of three No. 000 copper wires on 40-ft. steel towers placed 12 to the mile. The wires for the past three years have been arranged in the form of a triangle, the apex of the tower and the ends of the cross-arm forming the corners, but the arrangement is being changed to the form of an inverted triangle, the lower wire being placed on a bracket on the side of the tower. One-fourth inch steel stranded cable will be run on the apexes of the towers for lightning protection. The insulators are also being changed and a much larger form is being installed.

Illinois Traction System.—The new roads which this company is building in the southern part of Illinois will all be operated by the single-phase alternating-current method. The trolley wire will be hung with 3-point suspensions, the catenary type of construction being used. The Peoria Bloomington & Champaign line, now under construction, will be started single-phase. The Chicago Bloomington & Decatur line, which was opened for service on July 4, is now being operated by direct current, but the overhead work is catenary suspension and the road will be changed to alternating current as soon as the new equipments are on the ground and the new power house at Peoria is in service. It is proposed to operate the high-tension lines from the Riverton and Peoria power houses in multiple. Substations will be arranged so that sections of the high-tension line can be cut out and the road operated from the different power houses. H. C. Hoagland, electrical and mechanical engineer, Danville, Ill.

POWER HOUSES AND SUBSTATIONS.

Indianapolis & Louisville Traction has purchased several acres of land at Scottsburg, Ind., on which to build a power house, car barns and other buildings.

Portland General Electric Company, Portland, Ore., has let a contract for erecting a $22,000 substation at Knott and Williams Aves., to Frieberg Brothers.

Newcastle & Harmony Street Railway.—This company, which expects to build to Ellwood, Pa., this summer, will erect a power house at Eidenau. A large hydraulic turbine will be installed.

Indianapolis Crawfordsville & Western Traction.—The Electrical Installation Company, Chicago, has the contract for the power house and substation buildings and equipment, the overhead construction and rolling stock.

Indianapolis Newcastle & Toledo Electric Railway.—It is reported that the officials have decided on Newcastle, Ind., as the site for their main power plants and that a 35-acre tract of land on the Elliott farm southwest of the city has been chosen.

Manchester Traction Light & Power Company is soon to begin the work of remodeling its water power department at Kelley's Falls, N. H. The entire old equipment is to be replaced. Among the improvements will be a new steel penstock and new waterwheels.

Pittsburg Harmony Butler & New Castle Street Railway.—It is stated that this company, which is to connect Pittsburg with Butler and New Castle, Pa., has decided to build its power plant at Evans City, Pa., and that it has acquired ground for the purpose.

Forest City Railway.—This company, which is building the "three-cent fare" line in Cleveland, O., has completed the preliminary steps for the purchase of a site for a power house, having a 326-foot frontage on Walworth avenue below the Fulton road bridge. T. C. Alber, general manager, Cleveland, O.

Norfolk & Portsmouth Traction.—A contract has been awarded to the Schofield Construction Company of Philadelphia for the construction of a new power house at Reeves avenue and Mills street, Norfolk, Va. The building, which is to cost $190,000, will have a floor area of 168x157 feet and will be of brick and concrete.

Guatemala Street Railway has selected the site for its new 3,500-horsepower plant 20 miles south of Guatemala City, Guatemala. The company will furnish light and power to the public in addition to running the street cars of the city. This will call for a considerable amount of electrical equipment and water-power machinery.

Northern Indiana Traction sustained considerable damage to its power house by reason of the storm which recently swept northern Indiana. Connections were broken off the boilers and engines, the switchboard was wrecked and the pipes were twisted and bent out of shape. It is estimated that the damage to the building was about $5,000.

Sao Paulo Tramway Light & Power Company, Brazil, South America, is about to instal at its generating station a General Electric three-phase, revolving field, 2,000-kilowatt, 2,300-volt generator, three General Electric 60-cycle, 666-kilowatt, 24,000-2,000 volt transformers and three 60-cycle, 666-kilowatt, 20,000 2,300-volt transformers of the same type.

Chippewa Valley Electric Railroad, Eau Claire, Wis., has let the contract to the Power Engineering Company, Minneapolis, for a pair of horizontal turbines, and will install with these wheels a direct connected 500-kilowatt generator. The company has under consideration the development of an outside water power, which will require an expenditure of $200,000.

Puget Sound Electric Railway is reported to have begun the construction of a power plant at Buckley, on the White River, which is to furnish additional power to this line, and for the street railway systems in Tacoma and Seattle. It is stated that the plant will cost from $3,000,000 to $5,000,000, and that between 50,000 and 60,000 horsepower will be developed.

Dallas-Sherman Interurban Railway is stated to have made a preliminary contract, signed by Frank H. Proctor, fiscal agent for this company, and by the citizens' committee of McKinney, Tex., whereby the former agrees for the consideration of 450 shares of stock to be taken by the city to build its main power house in McKinney, and also to construct and maintain not less than 4 miles of street railway in the city. The power house is to cost $300,000.

Philadelphia Rapid Transit Company has recently placed orders with the Westinghouse Machine Company of Pittsburg for a complete equipment of Roney mechanical stokers for its large subway power plant now building in Philadelphia. This plant was constructed for turbine machinery and Westinghouse-Parsons turbines of 6,000 K. W. capacity will be installed. The order covers stokers for the entire boiler plant of 32,700 horsepower. Boilers are of the Parker water tube type.

New York New Haven & Hartford.—It is reported that the electric power station now being erected by Westinghouse, Church, Kerr & Co., at Coscob, Conn., to supply power for the electric trains between New York and Stamford, Conn., is about ready for the installation of electric machinery. The initial installation will consist of Westinghouse-Parsons steam turbines and Westinghouse alternating current single phase generators, with a capacity of 12,000 horsepower.

SHOPS AND SHOP EQUIPMENT.

Sioux City Traction will soon begin work on its proposed new car barns in Sioux City, Ia.

Philadelphia Rapid Transit.—Bids have been received by Chief Engineer W. S. Twining for the erection of a new car barn at Allegheny avenue and Twenty-Sixth streets, Philadelphia.

Lima, O.—Bids have been received for the new general offices and car barns for the Schoepf-McGowan syndicate lines in Ohio, which are to cost $200,000. Specifications require that the work shall be completed in four months.

Indiana Union Traction.—In consideration for an extension of its local franchise in Anderson, Ind., until 1952 this company has agreed to build its main car and repair shops in that city at a cost of about $125,000 before July 7, 1907.

Northern Electric Company is preparing plans for extensive additions to its shops in Chapmantown, a subway of Chico, Cal. The wood-working and car-repairing departments are to be enlarged and new machinery is to be installed.

Schenectady (N. Y.) Railway.—Plans have been prepared for an up-to-date machine and repair shop 150x200 feet in floor area, and a carpenter shop, paint shop, storeroom and office building, to be erected on Albany street, Schenectady, N. Y.

Cleveland & Southwestern Traction has completed plans and will shortly close contracts for the erection of a large repair shop at Elyria, O. The building will be equipped with air hoists and a complete machine shop equipment. C. N. Wilcoxon is now general manager.

Northern Illinois Light & Traction.—The Northern Illinois Light & Traction Company, Ottawa, Ill., has perfected plans for a new car barn and repair shop. The structure will occupy a plot of ground in the southern part of the city. The barn now in use will be abandoned.

Philadelphia Rapid Transit Company has asked for bids on one-story reinforced concrete car barn and a two-story office building, with a total floor area of 495x370 feet, at Twenty-sixth St. and Allegheny Ave., Philadelphia. Bids are also asked for additional stories on the shops at Kensington Ave. and Sargent St.

FRANCHISES.

Decatur, Ill.—The Illinois Traction Company has been granted a 50-year franchise to run its cars over the city street car tracks.

Dayton, O.—The People's Street Railway has applied for a franchise to construct a single-track loop from its present southern terminus on the Shakertown pike.

Marshall, Tex.—Mr. H. Tomlinson, of Grand Rapids, Mich., has applied for a 40-year franchise for an electric line in Marshall and between Marshall and Shreveport, Tex.

Windsor, Ont.—A fifty-year franchise has been granted to the Windsor Essex & Lake Shore Electric Railway, at present under construction from Windsor to Leamington, Ontario.

Janesville, Wis.—H. H. Clough has asked the city council for a franchise for a line from Janesville to Madison, connecting with the Rockford Beloit & Janesville. Surveys have been made.

Liberty, Mo.—A 30-year franchise has been granted to the Kansas City St. Joseph & Excelsior Springs Railway, which proposes to build an electric line 30 miles long between the points named.

Columbus, Ind.—The Bartholomew County Commissioners have granted a 50-year franchise to C. S. Furgeson to build an electric line from Columbus to West Baden, Ind., work to begin within three years.

Kalamazoo, Mich.—A franchise has been granted to the Kalamazoo Gull Lake & Northern Railroad, which proposes to build a line from Holland to Gull Lake, Mich. W. W. Jacobs, of Chicago, is interested.

Evansville, Ind.—The franchise of the Evansville & Henderson Traction Company has been revoked, as the road was not begun within the specified time. The company will ask for a new franchise.

Philadelphia, Pa.—The board of highway supervisors has granted a permit to the Philadelphia Rapid Transit Company to construct a double track line on Allegheny Ave. between Germantown Ave. and Richmond St.

Mascoutah, Ill.—The city council has granted a franchise to the Mascoutah & Belleville Electric Railroad to operate a street car line over the streets of the city, the entrance to be made on Mill street. Work must begin in six months.

Paducah, Ky.—The Paducah Traction Company has applied to the board of aldermen for a franchise to build a loop from Seventeenth and Broadway Sts. to Nineteenth and Broadway, and thence down Nineteenth St. and Guthrie Ave. to Tennessee St.

New York City Interborough Railway.—The New York Board of Railroad Commissioners has granted this company permission to run its tracks over the bridge which carries One Hundred and Eightieth street over the tracks of the New York Central.

Chicago, Ill.—Formal acceptance has been filed with the city by the West Side Metropolitan Elevated Railway Company of the ordinance granting this company the right to extend its Humboldt and Douglas Park branches to the city limits. This is the final step in securing the franchise grant which this company has been seeking for some time. The company plans to push the work as rapidly as possible in order to have the line open for traffic in the spring.

Malone, N. Y.—The village trustees have granted a forty-year franchise to the Malone Fort Covington & Hopkins Point Railway, which proposes to build a street railway in Malone and to Hopkins Point, 21 miles. Captain William Enright is the promoter.

Butte, Mont.—The Silver Bow County Commissioners have granted a 22-year franchise to the Butte Electric Railway, which operates the street railway lines of Butte, for an extension to Columbia Gardens, an amusement park owned by the company.

Joplin, Mo.—A 50-year franchise through the city has been granted to H. W. Mitchell of New York and W. S. Brawner of Saint Louis, who propose to build an interurban line 100 miles long, comprising a loop through Jasper, Newton and Lawrence counties.

Anoka, Minn.—A. B. Robbins, president of the North Side Street Railway of Minneapolis, Minn., has applied for a franchise for an electric line from Anoka to Osseo and Robbinsdale, Minn., to connect with the North Side Street Railway's line from Minneapolis.

Winchester, Va.—The Frederick county board of supervisors has granted the Winchester & Washington City Railway a franchise for a road from Winchester through a number of towns in the county to a connection with the Southern Railway at or near Blue Mount.

Pine Bluff, Ark.—The Citizens Light & Transit Company has applied for a franchise to build a street car line on Fifth Ave. to Missouri St., thence South to Sixth Ave. and then to the eastern limits of the city. The city attorney has been instructed to prepare an ordinance.

Joplin, Mo.—A 50-year franchise has been granted to R. C. Rawlings of Chanute, Kan., who proposes to build an electric railway connecting the Joplin mining district with a number of small towns in southeastern Kansas, to run his line through the town and to build a viaduct.

Toledo, O.—A franchise has been granted to the Ottawa Park Street Railway for tracks on Upton avenue connecting its present line with the Dorr street city line. This extension will be built at once and will make possible a ride from almost any part of the city to the park for one fare.

New York, N. Y.—The board of estimate on June 6 postponed action on a proposition to instruct the Rapid Transit Commission to lay out an elevated loop connecting the Manhattan terminals of the Brooklyn and Williamsburgh bridges, until the return of Mayor McClellan in the fall.

Litchfield, Ill.—The Supreme Court of Illinois has decided not to hear the case of the Illinois Traction Company, asking for the right to place its tracks across the Illinois Central, Wabash and Burlington railroads at Litchfield. The railroads are therefore permitted to take up the tracks of the electric road.

Columbus, Ind.—C. S. Ferguson has applied for a franchise for an interurban line from Columbus to French Lick and West Baden, Ind. The promoter expects to make traffic arrangements with the Indianapolis Columbus & Southern for a through route to Indianapolis, and claims he has secured most of the right of way.

Chickasha, I. T.—A franchise has been granted for building a street railway system in this city. Capital stock of the company is $100,000. A 500-horsepower engine, boilers and 200-kilowatt generators will be purchased. M. D. Nouthan is president, J. G. V. Redman, first vice-president; W. T. Croslen, secretary, and Scott Jones, general manager.

Galveston, Tex.—The Galveston franchise of the Houston-Galveston Traction Company, which proposed to build a line from Houston to Galveston, Tex., became void on July 1 because of failure of the company to file a bond. It is now stated that Stone & Webster, of Boston, will build a road between the two cities, as they already own city systems and have terminal facilities in both cities.

Ottawa, Ill.—A 50-year franchise has been granted to the Peoria Streator & Ottawa Railway, recently incorporated by the Illinois Traction Company to build through the cities named, for a railway through several streets in the city, to be completed by July 1, 1908. The franchise requires that the tracks enter the city over a new steel bridge to be built across the Illinois river. Surveys have been made.

Fort Collins, Colo.—A franchise has been granted to the Denver & Interurban Railroad for about 15 miles of electric railway in the city, three miles to be in operation by January 1, 1908, and one or more miles each year thereafter until the full amount is completed. The officers of the company are: A. D. Parker, president; T. S. McMurray, vice-president; H. W. Cowan, chief engineer; all officers of the Colorado & Southern steam road.

New York, N. Y.—The appellate division of the supreme court of New York has appointed two commissions to hold hearings and report to the court as to whether two extensions to the present rapid transit system, as approved by the Rapid Transit Commission, should be built. The first is the White Plains Road extension of the present elevated railway, from 177th street and West Farms road to the boundary of Mount Vernon. The second is the Jerome avenue subway, from 164th street to Woodlawn road with branches to the New York Central bridge over the Hudson river, and to Eighth avenue near 154th street.

FINANCIAL

Aurora De Kalb & Rockford Electric Traction.—This company has purchased the De Kalb-Sycamore Electric Company, operating between De Kalb and Sycamore, Ill. The consideration is said to have been $300,000.

Wetzel & Tyler Railroad.—This road, operating 10 miles between New Martinsville and Sistersville, W. Va., will be sold at auction on July 24 to satisfy the claim of Tennis Brothers of Pittsburg for $15,000.

Lafayette & Logansport Traction.—This company has filed a mortgage with the Guarantee & Safe Deposit Company, Philadelphia, to secure an issue of $1,000,000 bonds for building a road between the cities named.

New York & Queens County Railway.—This company has applied to the New York railroad commissioners for permission to issue $10,000,000 first mortgage refunding bonds to retire existing indebtedness and provide for various improvements.

Evansville & Princeton Traction, Princeton, Ind.—This company has been sold to the Evansville Princeton & Vincennes Interurban Railway, owned by the Murdock-Marshall syndicate, which is trying to consolidate the lines about Evansville, Ind.

Interurban Railway.—This company has increased its capital stock to $1,200,000 to provide for the new line to Carlisle, Ia., and the completion of the new line to Perry, Ia. The lines from Des Moines to Colfax and Woodward are now in operation.

Dayton & Western Traction.—This company, which was recently leased to the Indiana Columbus & Eastern Traction Company, has increased its capital stock from $1,300,000 to $1,700,000, the new stock to be issued as needed for improvements.

Holyoke (Mass.) Street Railway.—The Massachusetts Railroad Commissioners have authorized this company to issue 1,000 additional shares of stock at $150 for the purpose of liquidating a floating debt, making improvements and purchasing new equipment.

Columbus Buckeye Lake & Newark Traction.—This line has been taken over by the Indiana Columbus & Eastern Traction Company, which is the holding company organized under the direction of the Widener-Elkins syndicate. The price paid is said to be about $2,500,000.

Ft. Wayne & Springfield Traction.—Bonds have been sold for the construction of this road from Fort Wayne to Decatur, Ind. The Cleveland Trust Company, Cleveland, O., is trustee for the bondholders. W. H. Fledderjohann, Decatur, Ind., is president and general manager.

Pottstown & Reading Street Railway.—At the annual meeting Peter Boyd, of Philadelphia, was elected president in place of Samuel H. Ashbridge, deceased. L. K. Harvey was elected secretary, succeeding T. H. McCalla, and L. K. Brooks, treasurer, succeeding Schuyler Armstrong.

Boston & Worcester Electric Companies.—The trustees of this company, which controls the Boston & Worcester Street Railway and allied lines, have called a meeting of the stockholders for July 14 to vote on the proposed issue of 6,000 additional shares each of preferred and common stock.

Union Gas & Electric Company.—This company has secured a 99-year lease of the Cincinnati & Eastern Traction Company and is making preperations to lease the Suburban Traction Company. Both companies are controlled by the Interurban Railway & Terminal Company of Cincinnati.

Hattiesburg & Mammoth Springs Electric Railway.—Officers have been elected as follows: J. R. S. Pitts, president; S. O. Pitts, assistant to the president; J. P. Wetherbee, vice-president and general manager; E. F. Ballard, treasurer; A. S. Pitts, secretary. Headquarters, Hattiesburg, Miss.

Manchester (N. H.) Traction Light & Power Company.—This company has acquired the $200,000 capital stock of the Goff's Falls Litchfield & Hudson Street Railway and will extend it to Nashua, N. H., making a through line between Manchester and Nashua. J. Brodie Smith, of Manchester, is general manager.

Philadelphia Rapid Transit Company.—This company has taken a 999-year lease of the properties owned by the Philadelphia Morton & Swarthmore Street Railway and the Media Middletown Aston & Chester Electric Railway, which own about 25 miles of track, and will operate them as a part of its system.

Pittsburg & Allegheny Valley Railway.—This road, which extends from Apollo to Leechburg, Pa., 8 miles, and is under construction to Parnassus, about 25 miles, has been purchased by M. K. McMullen of Pittsburg and others. The deal includes a power house and franchises for power and light in several towns.

Municipal Traction Company, of Cleveland, O., has perfected its organization and taken over the property of the Forest City Railway. Officers: A. B. Dupont, president and general manager; Frederic C. Howe, vice-president; W. B. Colver, secretary; Edward Wiebenson, treasurer, and F. C. Alber, assistant general manager.

Northern Ohio and Canton-Akron Lines Consolidated.—The details of the consolidation of the Northern Ohio Traction & Light Company and the Tucker-Anthony properties south of Akron, have been agreed upon and the contract has been signed. The actual consolidation will not take place for some time, but the properties will now work together. The merging of the three Tucker-Anthony properties will be first effected and the preferred stock converted into bonds. The Tucker-Anthony properties will then have a total outstanding debt of $4,500,000 and an outstanding common stock of $1,038,000.

United Railways Company.—It is reported that this company, controlling a franchise on Front street, Portland, Ore., the Oregon Development Company, and right of way connecting Portland with outlying towns in the Willamette Valley, has been sold to C. E. Loss of San Francisco, Cal., who is said to represent eastern capitalists.

Lake Shore Electric Railway.—This company has sold $500,000 of 5 per cent 30-year first mortgage bonds in the name of the Sandusky Fremont & Southern for the purpose of beginning construction on this extension from Sandusky to Fremont, Tiffin and Fostoria, O. These bonds are guaranteed by the Lake Shore Electric.

Muncie & Union City Traction.—This company, recently incorporated to build from Muncie to Union City, Ind., will not build a new line, but will take over the Dayton & Muncie, which connects the two cities, for the Indiana Union Traction Company. The incorporators of the new company are all officers of the latter company.

Nashville & Huntsville Railroad.—Thos. M. Steger, of Nashville, president of this proposed road from Nashville, Tenn., to Huntsville, Ala., has issued a circular stating that $1,500,000 in cash will be deposited with a trust company for building the road as soon as the people along the line purchase stock amounting to $250,000.

Torrington & Winchester Street Railway.—Control of this company, operating 13 miles of track in Torrington and Winsted, Conn., has been sold to the Consolidated Railway Company, controlling the electric lines of the New York New Haven & Hartford. It is expected that the new owners will extend the line to Thomaston and Waterbury.

Illinois Traction Company.—The comparative statement of earnings for the month of May shows net earnings of $99,122, compared with $82,195 for the same month last year and $60,896 for May, 1904. For the five months ending May 31, 1906, the net earnings were $474,200, while for the same period of 1905 they amounted to $399,367.

Oregon Electric Railway.—This company, recently incorporated to take over the property of the Willamette Valley Traction Company, which is building a road from Portland to Salem Ore., has elected officers as follows: Harold B. Clark, president; Henry L. Corbett, Portland, vice-president; William Elliott, New York, treasurer; and Arthur E. Goddard, New York, secretary.

Fort Worth, Tex.—A company of eastern capitalists is negotiating for the purchase of the Fort Worth & Arlington Heights Traction Company, the Forth Worth & Rosen Heights Street Railway and the Citizens' Light & Power Company, and it is stated that the new company will build a line from Fort Worth to Mineral Wells and erect a power station at Arlington Heights.

Poland Boardman & Canfield Railway.—This company, recently incorporated to build an electric railway from Poland to Canfield, O., to connect with the Youngstown & Southern and the Youngstown & Ohio River, has elected the following officers: H. H. Stambaugh, president; S. J. Dill, vice-president and general manager; David Tod, secretary and treasurer; all of Youngstown, O.

Toledo & Western Railway.—Charles F. Franklin, general manager, of Toledo, O., has been appointed receiver for this company by Judge Taylor of the United States circuit court at Toledo, on complaint of Arthur E. Bingham, of Swampscott, Mass., who has a note against the company for $5,125. The company owns 67 miles of track between Toledo and Fayette, O., with a branch to Adrian, Mich.

Manchester Traction Light & Power Company.—The New Hampshire railroad commissioners have given this company permission to increase its capital stock to $350,000 for the purpose of acquiring the Goff's Falls Litchfield & Hudson Electric Railway, laying a double track between Manchester and Goff's Falls, N. H., and installing additional equipment at the Kelley's Falls and Garvin's Falls plants.

Indianapolis & Cincinnati Traction.—Charles L. Henry, president of this company which operates 70 miles of road out of Indianapolis, Ind., has been appointed receiver by Judge Carter of the Marion county superior court, application of W. M. Frazee, of Rushville, O. It is alleged that the company is unable to meet an outstanding indebtedness of $500,000 but as the assets are greater than the liabilities it is said that the suit is a friendly one to expedite a readjustment of the company's finances.

Ohio Valley Traction Merger.—It has been announced that 66 miles of electric railway in the valley of the upper Ohio river will ultimately be under one management. The plans have been completed and the work of construction is now well under way on the double track that will ultimately connect Pittsburgh and Wheeling, W. Va. The East Liverpool Traction & Light Company and the Ohio River Passenger Railway Company, with a Pennsylvania charter to build 11.1 miles of road, and the Steubenville & East Liverpool Railway & Light Company to build 8 miles of track to connect with the lines of the Steubenville Traction & Light Company at Toronto, O., are the companies closing up the gaps. The deal is financed by New York and Buffalo capital. W. Caryl Ely of Buffalo, N. Y., president of the Ohio Valley Finance Company, is managing the transaction. The line will have easy curves and low grades, the maximum being not over 1½ per cent. and will serve a population of over 250,000. The rails used will be of 85-lb. section in 60-foot lengths. Twenty-five interurban cars of recent design are to be used on the through service. For the local service the East Liverpool Traction & Light Company has recently ordered 11 cars from the Kuhlman Car Company.

Youngstown & Ohio River Railroad.—This company, which proposes to build a line from Youngstown to East Liverpool, O., has increased its capital stock from $10,000 to $1,700,000 and has acquired the right of way and franchises of the Youngstown & Southern Railroad between Lisbon and East Liverpool. The Youngstown & Southern is a steam road 16 miles long connecting Youngstown and Columbiana and was planning to extend to East Liverpool and operate the entire line by electricity.

Schoepf-McGowan Syndicate Advancements.—The Dayton & Northern Traction Company, which operates 43 miles between Dayton and Greenville, O., has been bought by the Schoepf-McGowan syndicate. At Greenville the Dayton & Northern connects with the Dayton & Muncie which is also controlled by the syndicate. It is planned to build a new line from Dayton to Richmond and it is reported that all the traction schedules running to Dayton will be operated into Cincinnati over the tracks of the Cincinnati Dayton & Toledo Traction Company.

St. Louis & Suburban Railway.—Negotiations have been begun for the transfer of this company and its constituent properties to the United Railways Company at St. Louis, thus merging all of the city and suburban lines of St. Louis into one company. The St. Louis & Suburban controls the Brentwood Clayton & St. Louis Railway, the St. Louis & Merrimec River Railroad, and the St. Louis & Kirkwood Railroad. Each share of Suburban stock will be exchanged for one share of United Railways preferred. It is said that the deal will be completed within a week and that the service is to be greatly improved.

Indiana Columbus & Eastern Traction.—The deal has been concluded by which this company, recently incorporated, has consolidated traction lines in Ohio controlled by the Schoepf-McGowan syndicate, aggregating 349 miles of track. The company recently increased its capital stock to $12,000,000. The following lines are included: The Dayton Springfield & Urbana, the Urbana Bellefontaine & Northern, the Columbus London & Springfield, the Columbus Grove City & Southwestern, the Columbus Buckeye Lake & Newark, the Columbus Newark & Zanesville, the Columbus & Lake Michigan, the Dayton & Western, the Dayton & Northern, the Dayton & Muncie and the Zanesville Light & Power Company.

Traction Consolidation in Pennsylvania.—J. G. White & Co. of New York has secured control of the principal electric railway and lighting properties in and adjacent to Schuylkill County, Pennsylvania, and will proceed to improve and operate them. The railways involved are: Pottsville Union Traction Company, Pottsville & Reading Railroad, Schuylkill Haven & Orwigsburg Street Railway, Schuylkill Electric Railway, Tamaqua & Lansford Street Railway, Tamaqua & Pottsville Electric Railway, Coal Castle Electric Railway and Port Carbon & Middleport Electric Railway. The mileage of these lines is at present 57.18 and extensions are planned amounting to 20 miles more. William A. Read & Co. of New York, and Forest & Co. of Philadelphia are engaged in working out the financial details of the consolidation.

RECENT INCORPORATIONS.

Evansville Princeton & Vincennes Interurban Railroad.—Incorporated in Indiana with a capital stock of $100,000. Incorporators: Henry W. Marshall, S. T. Murdock, Robert Todd, J. M. Barrett, W. V. Stuart, William Wallace and L. C. Neely.

Sioux City & Nebraska Southern Railway.—Incorporated in Nebraska to build a line from Sioux City to Homer, Neb. Capital stock, $300,000. Incorporators: John Boomer, Wm. Falley, Frank D. Truman, John D. Browning and Robert S. Vivian.

Alton Calhoun & Quincy Electric Railroad.—Incorporated in Illinois to build a line between Grafton and Rockport, Ill. Incorporators: Chas. L. Wood, Dr. J. R. Vaughan, B. L. Douglass, McClellan Johnson, Howard A. White and John J. Kinder.

Tulsa Street Railway.—Incorporated in Indian Territory to build a street railway in Tulsa, I. T. Capital stock $200,000. Officers: J. M. Hall, president; P. L. Price, vice-president; Dr. Fred S. Clinton, treasurer; J. D. Hagler, treasurer; all of Tulsa.

Argentine & Eau Claire Railroad.—Incorporated in Pennsylvania to build a line 3 miles long in Butler County. Capital stock, $30,000. Incorporators: Harry A. Kinney, president; Norman Sebring, John Forsythe and Edward Lloyd, all of Windber, Pa.

Carthage & Western Illinois Electric Company.—Incorporated in Illinois to operate an electric railway in Hancock County. Capital stock, $2,500. Incorporators: W. M. R. Vose, H. E. Page and M. H. Sadler. A franchise to enter the town of Carthage has been applied for.

Du Page Railroad.—Incorporated in Illinois to build from Wheaton to Naperville, Ill. Capital stock, $5,000. Incorporators: Walter F. Keeney, Asa M. Royce, Alvin Scott, Jonathan F. Royce and Samuel Mather, all of Naperville, where the offices of the company are located.

American Cities Railway & Light Company.—Incorporated under the laws of New Jersey to take over the Birmingham (Ala.) Railway Light & Power Company, the Memphis (Tenn.) Street Railway, the Nashville (Tenn.) Railway & Light Company, the Little Rock (Ark.) Railway & Electric Company, the Knoxville (Tenn.) Railway & Light Company, and the Houston (Tex.) Lighting & Power Company. The capital stock is $15,000, but it is the intention to increase it later to $27,500,000 to exchange for the stock of the old companies. J. K. Newman, of New York and New Orleans, will be president of the company.

Elmira & Seneca Lake Traction.—Incorporated in New York to reorganize the Elmira & Seneca Lake Railway, of Elmira, N. Y., which has been in a receiver's hands for some time. Capital stock, $200,000. Directors: W. H. Wadhams, M. W. Dodge and A. S. Cooke, of New York.

Gary & Hammond Traction.—Incorporated in Indiana to build from Hammond to Gary, the new town being built by the United States Steel Corporation. Capital stock, $10,000. Incorporators: Kemper K. Knapp, William Duff Haynie, Gilbert R. Call, Mark Breeden and William Brye.

Iowa City Montezuma & Des Moines Railway.—Incorporated in Iowa to build a railroad between Des Moines and Montezuma, Ia. Capital stock, $10,000. Officers: Hon. Geo. W. Ball, president, Iowa City; Capt. J. W. Carr, vice-president, Montezuma; Willard J. Welch, secretary, Iowa City; Charles R. Clark, treasurer, Montezuma.

Hillsboro Kimmswick & Northern Railroad.—Incorporated in Missouri to build an electric line from Jefferson Barracks to Montesano Park, an amusement park near St. Louis, Mo. Capital stock, $300,000. Incorporators: H. W. Gutke, A. F. Furrer, L. A. Hall, Charles A. Gutke and James F. Ring. The Montesano Springs Improvement Company of St. Louis is behind the project.

Toledo Defiance & Fort Wayne Railroad.—Incorporated in Ohio to build a railway from a point on the western boundary of Defiance County through Defiance, Williams, Paulding and Henry counties to Toledo, O., and from the eastern boundary of Allen County, Ind., to Fort Wayne. Capital stock, $10,000. Incorporators: E. B. Paxton, James H. Horan, George A. Shanks, Frank G. Crane and David L. Stine.

Newkirk Tonkawa & Southern Electric Railway.—Incorporated in Oklahoma to build a road from Newkirk to Oklahoma City, Okla., passing through Peckham, Blackwell, Billings, Perry, Orlando, Mulhall, Guthrie and Edmond. Capital stock, $1,500,000. Incorporators: M. P. Brown, J. S. Kerfoot and H. E. Elder, of Oklahoma City; Thomas S. Smith, of Newkirk, and E. G. Warfield, of New York. Headquarters, Oklahoma City.

Suffolk Traction.—Incorporated in New York to build a railroad 28 miles long from Brookhaven through Bellport, Patchogue, Blue Point, Bayport, Sayville and Islip to Babylon, N. Y. Capital stock $1,200,000. Incorporators: C. L. Rossiter, D. H. Valentine, Henry Seibert, William F. Sheehan and T. L. Hughes of Brooklyn, N. Y.; Chas. A. Collifon, New York; W. H. Jaycox, M. C. Wiggins, and G. G. Rose of Patchogue, N. Y.; and Benjamin H. Wood, of Babylon, N. Y.

DeKalb Sycamore & Interurban Traction.—Incorporated in Illinois to build electric lines from DeKalb to Belvidere, from Sycamore to Elgin, and from De Kalb to Yorkville, Ill., with branch lines from DeKalb to points in the counties of McHenry, Kane, Ogle, Lee, Kendall, LaSalle and DuPage. Capital stock, $100,000. Incorporators: John W. Glidden, S. E. Bradt and W. H. Zimmerman, of De Kalb; and David A. Syme and Frederick B. Townsend, of Sycamore.

Norfolk & Jamestown Railway.—Incorporated in Virginia to build a line from a point on the Norfolk & Atlantic Terminal Company's line between Norfolk and the Jamestown Exposition grounds to points in the neighborhood of Norfolk and Sewall's Point. Capital stock, $300,000. Incorporators: Alexander Brown, president; B. H. Griswell, Jr., vice-president; Austin McLanahan, secretary and treasurer; John I. Rowe, Irving E. Campbell, William L. Royall and John J. Blake, all of Richmond, Va.

Buffalo & Lackawanna Traction.—Incorporated in New York to build an electric road 5 miles long from the city limits and the Hamburg turnpike to the center of Buffalo, to connect with the Sheehan-Mayer roads between Buffalo and Erie, Pa. Capital stock, $1,000,000. Incorporators: Joseph B. Mayer, Ashley T. Cole, William F. Sheehan, Charles H. Werner and Marshall J. Dodge of New York, J. C. Calisch, John F. Burke, Charles V Nellany and Oscar F. Georgi of Buffalo. Application for a franchise has been made to the city council.

Trans-Niagara Bridge Company.—Incorporated in Ontario, Can., to build a bridge across the Niagara Gorge, north of the present steel arch bridge. Capital stock, $1,000,000. Incorporators: Frederick Nicholls, Sir Henry M. Pellatt, E. R. Wood, H. G. Nicholls and Allen C. Boyce, all of Toronto. This is in connection with the project of a Canadian syndicate to connect Rochester and Toronto via the new Buffalo Lockport & Rochester, the International Railway Company of Buffalo and a new road to be built to connect the roads of the latter company with Toronto.

Portland Railway Light & Power Company.—Incorporated in Oregon to effect the merger of various electric properties in and around Portland, Ore., recently purchased by the Clark, Pratt and Seligman interests. The company on July 1 took over the Portland Railway, the Portland General Electric Company, the Oregon Water Power & Railway Company, the Citizens' Light & Traction Company, of Salem, the Vancouver Electric Light Company and the Union Light & Power Company. Officers have been elected as follows: H. W. Goode, Portland, president; F. I. Fuller, Portland, and H. L. Clark, Philadelphia, vice-presidents; S. G. Reed, Portland, treasurer; C. N. Huggins, Portland, secretary. Capital stock, $15,000,000. Principal office, Portland, Ore.

ROLLING STOCK

Portland Railway, Portland, Ore., is in the market for new equipment.

Rhode Island Company is having 70 cars built by the Cincinnati Car Company.

Boston & Worcester Street Railway is about to order 10 express and freight cars.

Indianapolis & Western Traction recently ordered 10 cars from the Cincinnati Car Company.

Northern Indiana Railway, South Bend, Ind., was recently in the market for one interurban car.

Roanoke (Va.) Railway & Electric Company has received some new cars from the J. G. Brill Company.

Tacoma Railway Light & Power Company is having seven cars built by the Jewett Car Company.

Connecticut Railway & Lighting Company is having 22 cars built by the Cincinnati Car Company.

Capital Traction Company recently ordered 25 semi-convertible cars from the Cincinnati Car Company.

Northwestern Elevated is in the market for 34 electric cars similar to the last 35 that were ordered.

Columbus Newark & Zanesville Electric has ordered one interurban car of the Cincinnati Car Company.

Zanesville (O.) Railway Light & Power Company is having four cars built by the Cincinnati Car Company.

Winona (Ind.) Interurban has ordered four single-truck cars the McGuire-Cummings Manufacturing Company.

Meridian (Miss.) Light & Railway recently received five 20-foot semi-convertible cars from the American Car Company.

Jackson & Suburban Street Railway has contracted with the American Car Company for eleven 10-bench open cars.

Evansville & Eastern Electric may buy some additional double truck cars, but the matter is reported as not yet decided.

Memphis Street Railway has ordered 20 semi-convertible double truck cars, 42 feet in length, from the J. G. Brill Company.

Bluffton & Marion Construction Company has ordered five interurban cars from the Niles Car & Manufacturing Company.

Pacific Electric Railway, Los Angeles, has ordered 50 cars from the St. Louis Car Company for delivery beginning August 1.

Rock Island Southern has contracted with the Saint Louis Car Company for three passenger cars and one interurban express car.

Fort Wayne Van Wert & Lima Traction and **Lima & Toledo Traction** are having 10 cars built by the Cincinnati Car Company.

Indianapolis Traction & Terminal Company is having 50 cars built by the Cincinnati Car Company, 15 of which were ordered in February.

Chicago City Railway has ordered 50 additional cars from the J. G. Brill Company to be built by the American Car Company at St. Louis.

Galesburg & Kewanee Traction is in the market for three interurban cars. Sargent & Lundy, engineers, Chicago, have the matter in charge.

Monroe Street Railway recently received two 40-foot semi-convertible passenger cars and one 60-foot flat car from the American Car Company.

Holyoke Street Railway (Holyoke, Mass.) has been authorized to issue additional stock to purchase new equipment and make other improvements.

Grand Rapids & Kalamazoo Valley was recently reported in the market for from 12 to 15 cars. We are advised that no orders have yet been placed.

Anderson (S. C.) Traction Company has placed an order with J. G. Brill Company for three interurban cars. These will have General Electric equipments.

Burlington Traction Company has ordered two closed double truck cars from J. M. Jones' Sons. These will have Westinghouse equipments and Taylor trucks.

Columbus Delaware & Marion has contracted with the Niles Car & Manufacturing Company for two interurban cars. It is reported that these are 70-foot cars.

Birmingham Railway Light & Power Company has ordered and is receiving from the St. Louis Car Company twelve 14-bench open trailers and ten 40-foot motor cars.

Sabraton Railway Company, Morgantown, W. Va., has contracted with the American Car & Foundry Company for additional equipment to be built at its Wilmington shops.

Washington (D. C.) Railway & Electric Company has ordered 40 closed cars from the Saint Louis Car Company. These cars are 35 feet 1 inch long over all, with body 25 feet 6 inches long.

United Traction Company, Albany, N. Y., has under construction one new car to be experimented with for the purpose of establishing a standard type. If this proves satisfactory it is expected that an order will be placed for a number of similar cars. Nothing definite will be decided regarding the matter for some time. The company was recently reported as ordering twenty-five 4-motor equipments from the General Electric Company.

Evansville Electric Railway is having 15 cars built by the Cincinnati Car Company, of which 10 are 28-foot closed cars.

Georgia Railway & Electric Company states that it does not contemplate the placing of any car contracts this year, but will complete in its own shops 25 single truck and five double truck cars.

Louisville (Ky.) Railway has recently received 30 new double truck cars from the Saint Louis Car Company. They have Detroit platforms at the rear end and are equipped with General Electric 70 motors.

Inland Empire Railway, of Spokane has received four of the 15 interurban cars ordered from the Saint Louis Car Company. These cars are 41 feet in length and have a seating capacity of 50 passengers.

Los Angeles Railway has ordered 100 combination cars from the Saint Louis Car Company. These will be equipped with Westinghouse motor equipments, which will be placed on the cars at the shops of the company at Los Angeles.

Chicago Union Traction was reported in the market recently for additional equipment. We are advised that no specifications have yet been prepared, but that it is only a question of a short time before further equipment will be ordered.

Omaha Lincoln & Beatrice recently purchased from the St. Louis Car Company a 20-foot single-truck and a 30-foot double-truck box car, both being equipped with Westinghouse motors. Other equipment will be added at an early date.

Washington Water Power Company recently ordered one combination passenger smoking and baggage car and four semi-convertible trailers 36 feet in length from the J. G. Brill Company, in addition to the 20 cars ordered early in the year.

United Railroads of San Francisco has recently purchased 50 cars from the J. G. Brill Company which were in the course of construction for the Chicago City Railway Company, the purchase consummated through the courtesy of the latter company.

Erie has contracted with the St. Louis Car Company for five electric cars for its Rochester branch. These include four passenger cars and one combination passenger and baggage car. Each will be equipped with four 75-horsepower Westinghouse motors.

New York City Railway (Metropolitan Street Railway System) has ordered from J. G. Brill Company 43 closed passenger cars, which will be operated by General Electric motors and mounted on Brill trucks. Orders have also been placed for five electric snow sweepers.

New Jersey & Hudson River Railway & Ferry Company is having eight closed cars with 42-foot bodies built by the John Stephenson Company. These cars will have a seating capacity of 44, with smoking compartment, and will be equipped with M. C. B. trucks and General Electric motors.

Knoxville (Tenn.) Railway & Light Company is planning the purchase of additional equipment for fall delivery, but the plans and specifications have not yet been prepared and it has not been decided how many cars will be ordered. Ford, Bacon & Davis, New York, are the engineers in charge of the construction of the road.

Detroit United Railway has recently purchased 30 single truck car bodies from the Cincinnati Car Company and three interurban express car bodies from the Saint Louis Car Company. The trucks for the latter cars will be furnished by the Baldwin Locomotive Works, while the trucks for the 30 single truck cars will be manufactured by the Detroit United Railway.

Wheeling Traction Company has contracted with the G. C. Kuhlman Car Company for five additional Brill grooveless semi-convertible cars. These will be 40-foot cars with 28-foot bodies, to be equipped with four Westinghouse 101-B motors, k-28 controllers and Brill No. 27Fl trucks. They will have Hale & Kilburn seats, Hartshorn or Haviland shade rollers with Forsythe type of curtain fixtures, Nichols-Lintern air sanders and Dumpit sand boxes. The railway company will furnish the air brakes, registers, headlights and hot water heaters, which will be installed by the builders.

New York Central & Hudson River has contracted with the Saint Louis Car Company for six all steel combination baggage, mail and express electric cars for delivery on November 1. The specifications call for the following details:

Capacity	40,000 lbs.
Length—	
Inside	58 ft.
Over all	62 ft.
Width—	
Inside	9 ft. 1¾ in.
Over all	9 ft. 10½ in.
Height—	
Inside	9 ft. 5½ in.
Over all	13 ft. 9½ in.
Bolsters—	
Body	Built up type
Truck	Cast steel

Brooklyn Rapid Transit recently ordered 50 semi-convertible cars from the Jewett Car Company and 50 of the same type from the Laconia Car Company. These cars will have Westinghouse motors and air brakes, making 527 Westinghouse air brake sets furnished this road within the last 18 months. The specifications for the 100 cars recently ordered include the following:

Seating capacity	48
Length—	
Inside	30 ft. 7¼ in.
Over all	42 ft. 6 in.
Width—	
Inside	7 ft. 7 in.
Over all	8 ft. 2½ in.
Height—	
Inside	7 ft. 8⅜ in.
Over all	8 ft. 10 in.
Body	Wood, steel plate sides
Underframe	Wood
Axles	4¾ in.
Bolsters, body	Girder

TRADE NOTES

Sheaff & Jaasted, engineers, Boston, Mass., have removed their offices from 85 Utah St. to 88 Broad St.

Eureka Automatic Electric Signal Company announces the removal of its office from Lansford to its factory at Tamaqua, Pa.

H. M. Byllesby & Co. of Chicago announce that they have removed their general offices from 171 La Salle street to the American Trust building, Monroe and Clark streets.

Pittsburg Spring & Steel Company announces the appointment of E. H. Barnes, secretary of the Railway Supply & Equipment Company, 805-807 Equitable building, Atlanta, Ga., as its southern representative.

Utica & Mohawk Valley Railway, of Utica, N. Y., has specified No. 1 B heaters manufactured by the Peter Smith Heater Company, of Detroit, Mich., to bo used on the 15 cars now being built for the company by the J. G. Bull Company.

W. R. Garton Company, Chicago, announces that it has recently taken the general sales agency for the Wapak anchor. The company reports large sales of Shaw arresters and Lima porcelain insulators, one recent order being for 36,000 of these insulators to carry 33,000 volts.

Alling Construction Company announces its organization and that it is equipped to do a general contracting and building business. The offices are at 1507 Chicago Savings Bank building, State and Madison streets, Chicago. Van Wagenen Alling is president, and Franklin L. Allen, secretary.

W. N. Matthews & Bro., of St. Louis, Mo., announce that they have purchased the patent, all patterns and the entire stock of the O. K. sleet cutter, formerly owned, manufactured and sold by Porter & Berg, of Chicago, and all orders for that specialty should hereafter be addressed to them.

J. Hammond & Co., San Francisco, announce that their works escaped the earthquake and fire, and that, while they have several orders in hand for street and electric cars and also an order for 10 narrow gauge flat cars of 30,000 pounds capacity, they can give prompt delivery on steel or electric cars.

G. C. Kuhlman Car Company, Collinwood, O., has just finished an addition to its erecting shop, which increases the capacity of the erecting shop room about 15 cars and is expected to give the plant an annual output of 600 cars. The company makes a specialty of electric and interurban equipment.

Climax Stock Guard Company, 503 Title and Trust building, Chicago, announces sales of its clay cattle guards to the following companies: Chicago & Alton Railway, Central Railway of Georgia, Lowell & Fitchburg Street Railway, Auburn & Syracuse Railway and the Rochester Syracuse & Eastern Railway.

General Storage Battery Company, 42 Broadway, New York, presented an interesting exhibit of Bijur storage batteries at the convention of the National Electric Light Association held at Young's Pier, Atlantic City, N. J., June 5 to 8. The exhibit included various types of cells, batteries, boasters and switchboards.

Underfeed Stoker Company, Chicago, just received an order from the Georgia Railways & Electric Company of Atlanta for 18 additional Jones stokers to be installed at its shops at Atlanta. These will be used in connection with 3,600-horsepower Babcock & Wilcox boilers, and will make 30 Jones stokers installed by the company.

Electric Service Supplies Company announces the completion of its organization by the purchase of the business of the Meyer & Englund Company, Philadelphia, Porter & Berg, Chicago, Garton-Daniels Company and Electrical Devices Company, Keokuk, Ia. It acquires all the assets and assumes all the liabilities of these companies.

H. W. Johns-Manville Company, 100 William street, New York, has been meeting with considerable success in the installation of its J. M. combination felt coverings in mines and on surfaces exposed to extreme weather conditions. In several instances the feasibility of carrying the steam considerably over a mile has been demonstrated.

Electric Cable Company, Bridgeport, Conn., has recently installed an underground conduit system for the American Railways Company at Altoona, Pa. This system was laid in wooden trenches in which the wires were embedded in Voltax, a new insulating compound which is being extensively adopted by the railway companies throughout the country.

Albert & J. M. Anderson Manufacturing Company, Boston, Mass., has recently received an order from the Metropolitan West Side Elevated Railway of Chicago for 2,500 Anderson third-rail supporters. The company is now filling an order for the new type of third-rail insulators to be used in Boston, which will be fitted with the company's Aetna insulating material.

Railway Specialty & Supply Company, Chicago, Ill., has been incorporated to handle the following articles, in connection with which is their idea to solicit the business of the electric railway companies: Dressel headlights, signal lamps, switch and semaphore lamps, train order signal lamps, etc., elliptical springs, coil springs, pressed steel journal-box lids, railway tin and galvanized ware, waste, railway lanterns, car glass, oil labor-saving devices, tire expanders, contractors' lights, oil rivet heaters and paint and whitewash spraying machines. In addition to the above, they will handle a general line of steel and iron. The officers of the company are: R. N. Baylies, president; Joseph M. Brown, secretary and manager, and Philip W. Moore, representative.

Lagonda Manufacturing Company, Springfield, O., has recently perfected a valve which cuts off steam in the boilers of a plant in case either a steam header breaks off or a tube bursts in the boiler. The device is novel in the manner of operation, although simple in construction and is said to be the first on record to perform both of these functions effectively and by one mechanism.

Westinghouse Electric & Manufacturing Company has received an order from the Los Angeles Railway for 200 40-horsepower motors, to be used in the equipment of 50 new cars which the company is adding to its rolling stock. The company on July 2, removed its Salt Lake City district office to 212-214 South West Temple St., Salt Lake City, Utah. The Dallas district office was removed on the same date to 418 Main St., Dallas, Tex.

Allis-Chalmers Company, Milwaukee, Wis., reports recent orders for power equipment, including a 500-kilowatt steam turbine and alternator, and a 40-kilowatt generator, ordered by the Interstate Railways Company of Philadelphia, for the Wilmington & Edgemore Electric Railway, of Wilmington, Del.; also similar units for the Meriden Electric Light Company, Meriden, Conn.; Canton Light Heat & Power Company, Canton, O.; Western Gas & Electric Company, Aurora, Ill., and the city of Jacksonville, Fla.

Acme Truck & Tool Company, St. Louis, is being organized with a capital of $600,000 to manufacture trucks for electric railways. The leading stockholder is Frank G. Koehler, 3100 North Broadway, St. Louis, who is president of the Standard Truck & Forging Company. The others interested include Thomas H. Foerster, John M. Krieder and William Wahrenbracht. It is stated that when the plant of the new company is in operation the present business of the Standard Truck & Forging Company will be taken over by it.

The Recording Fare Register Company, of New Haven, Conn., reports that they have just participated in an endurance test of fare registers held by the Public Service Corporation of New Jersey at their Plank Road Shops in Newark. The report of the test made on the recording fare register was: "An entirely geared machine of very simple mechanism which showed very slight wear. The condition of the register at the conclusion of the test being first class in every particular." The register went through the entire test without repairs and registered over 1,000,000 fares.

Power & Mining Machinery Company, Milwaukee, announces several recent appointments. W. A. Liehlein has been made manager of the Salt Lake City branch, with offices at 215 Commercial Club building. W. C. Mac Dowell, formerly with the mining department of the company's New York office, has been appointed manager of the El Paso, Tex., office. N. B. Roper, formerly chief engineer for the Cananea Consolidated Copper Company, Cananea Mexico, has recently been engaged by the company to represent it as mining engineer at the New York sales office, 52 William street.

Lord Electric Company, Boston, Mass., has appointed several new agents for the sale of Thomas soldered rail bonds and Shaw non-arcing lightning arresters. These specialties are now sold through the following agencies: Universal Railway Supply Company, Baltimore, Md.; Newcomer-Manry Company, Atlanta, Ga.; Godfrey Morgan, Buffalo, N. Y.; the W. R. Garton Company, Chicago, Ill.; Krumbhaar & Aiken, New Orleans, La.; B. F. Kierulff, Jr., & Co., Los Angeles, Cal.; F. A. Lawson & Co., San Francisco, Cal.; B. W. Nunnally, Portland, Ore.; J. A. Dawson & Co., Montreal, Canada.

National Brake Company, Buffalo, N. Y., states that it has just entered into a contract with the Cincinnati Car Company whereby the latter ceases the manufacture of Taggert brakes and agrees to adopt the Peacock brake on cars built by it. The contract is stated to be for ten years and to carry an order for the first year for over 1,275 brakes. As the company builds many cars for roads in various sections of the country the contract will probably affect the equipment of several thousand cars. The Schoepf syndicate, which controls the company in question, also controls from 30 to 40 car lines and the contract is therefore of great value to the National Brake Company, as the Taggert patents have been turned over to it.

General Electric Company, Schenectady, N. Y., has leased a suite of rooms in the Monadnock building, San Francisco, Cal. The company has leased a tract of land in Emeryville and has placed upon it a temporary building for the handling of its present business. Work has been started on the new warehouse which will contain about 80,000 square feet of floor area and will be located at the southern end of the block bounded by Kansas, Rhode Island, Fifteenth and Alameda streets. At present the company is in excellent condition to fill orders as rapidly as before the fire. The General Electric Company has received large orders from the United Railroads of San Francisco for the equipment of its new rolling stock made necessary by the recent fire. These include twenty-five 4-motor, G. E.-80, 40-horsepower equipments; fifteen 4-motor, G. E.-90, 50-horsepower equipments, and ten 4-motor, G. E.-73, 75-horsepower equipments. All of these equipments will be supplied with the flexible Sprague-General Electric system of multiple unit control. The G. E.-80, 40-horsepower type of motor is being widely adopted in street railway work. The following orders for this equipment have been received by General Electric Company: The United Traction Company of Albany, N. Y., twenty-five 4-motor equipments; Philadelphia Rapid Transit Company, one hundred 4-motor equipments, and the St. Louis Railway Company, eighty-six 4-motor equipments.

ADVERTISING LITERATURE

Frank Ridlon Company, Boston, Mass., has recently issued a list of the second-hand apparatus which it has on sale.

Utica Drop Forge & Tool Company, Utica N. Y., has issued a pamphlet called "Plier Palmistry," describing and illustrating its line of nippers and pliers.

Crocker-Wheeler Company, Ampere, N. J.—Bulletin No. 64 describes form I motors and generators. It has 16 pages, 7½ by 10 inches, and 17 halftone illustrations.

Lumen Bearing Company, Buffalo, N. Y., is mailing copies of a publication entitled, "The Luminary" which contains considerable information regarding the company's products.

Power & Mining Machinery Company, Milwaukee, Wis., is issuing its catalogue No. 6 descriptive of machinery for the roasting, smelting and refining of copper and silver-lead ores.

Trussed Concrete Steel Company, Detroit, Mich., has recently issued two pamphlets. One is entitled "Fireproof Construction" and the other comprises the advance sheets of a treatise on the "Practical Calculation and Application of Reinforced Concrete."

Electric Storage Battery Company, Philadelphia, Pa., has recently issued bulletins Nos. 97 and 98 which deal with the application of storage batteries to central station lighting, power and railway plants.

Stanley-G. I. Electric Manufacturing Company, Pittsfield, Mass.—Bulletin No. 612 illustrates and describes the G. I. flush push button switch; bulletin No. 613, type K arc lamps; bulletin No. 148, polyphrase induction motors.

Allis-Chalmers Company, Milwaukee, Wis., has recently issued several bulletins. No. 1051 describes the belted type of alternating-current generators; No. 1411 describes modern rock-crushing plants, and No. 1504 describes steam turbines and generators.

Armitage-Herschell Company, North Tonawanda, N. Y., is issuing its catalogue for 1906. Illustrated descriptions are included of miniature railways, steam riding galleries, swings and other devices for amusement parks manufactured by the company.

Simplex Valve & Meter Company, Philadelphia, has issued a 24-page illustrated pamphlet describing a number of methods of measuring pressure and volume of water, with detailed descriptons of the Simplex water meter, Simplex controlling valve, and the Simplex automatic air valve.

Commercial Truck Company of America, Philadelphia, Pa., is issuing a catalogue descriptive of the Imperial electric motor. Attention is directed to the description of the Thayer auto trolley system whereby vehicles of all kinds may be propelled by power taken either from an overhead wire or a storage battery.

Coatesville Boiler Works, Coatesville, Pa.—A 32-page pamphlet, entitled "Coatesville Boilers," presents a list of 37 plants for which high duty tubular boilers have been furnished by this company to an aggregate amount of 74,000 horse-power and a list of over 600 other concerns for which plants of smaller capacity have been installed.

Westinghouse Electric Manufacturing Company, Pittsburg, Pa., is mailing circular No. 1129 descriptive of the No. 119 railway motor for direct-current service; circular No. 1132 descriptive of the Westinghouse protective apparatus, and circular No. 1134 descriptive of electrical and mechanical brakes for Westinghouse Type K motors.

Duff Manufacturing Company, Pittsburg.—A new catalogue devoted to the Duff roller bearing screw jack. It has 16 pages and cover, 6 by 9 inches, and is filled with information regarding Duff jacks of various sizes and types, several of which are built expressly for railway purposes. The company issues special catalogues on Barrett track jacks, Barrett car and journal jacks and other types.

Electric Service Supplies Company, recently formed by a consolidation of the Mayer & Englund Company, Porter & Berg, Garton-Daniels Company and Electrical Devices Company, is issuing an attractive pamphlet called "The Keystone Traveler," enlivened with catchy rhymes and stories presenting the merits of several of its specialties, such as ears, lightning arresters, rail bonds, gear cases, fenders, and park benches.

Westinghouse Church Kerr & Co.—In No. 2 of this firm's 75-page publication, "Work Done," are briefly described the engineering features of 43 undertakings in which this concern has been retained as engineer or contractor. The more recent works are described at considerable length, while a number are very briefly mentioned with reference to more complete descriptions which appeared in No. 1 of "Work Done." A publication of this nature is valuable as furnishing a concise record covering the principal points to which most frequent reference would be made.

Chicago Car Heating Company, Railway Exchange, Chicago.—Catalogue No. 5 is even more elaborate than its predecessors. It has 78 pages, 9 by 12 inches, printed on heavy enameled paper and filled with excellent illustrations, together with several folding plates in colors, showing the application of the vapor system of car heating. The catalogue describes this system in detail and states that the results attained by its use are of the greatest importance and value, and when considered in their relation to the solution of the car heating problem are far reaching and even revolutionary.

STANDARD MOTOR TRUCKS.

During the past three years three new types of trucks for electric cars have been developed at the works of the Standard Steel Car Company, at Butler, Pa. These types cover the three forms most used in electric traction and include a long wheelbase double truck with inside-hung motors for suburban service; a short wheelbase double truck with outside-hung motors for city service, and a single truck. The types are illustrated herewith.

As these trucks are in design radically different from any previous forms, long service tests were necessary to determine the value of the designs, and to correct any defects which might develop. Trucks of each type were placed in service and their operation carefully noted, and then other trucks were built with improvements as indicated by the service tests of the first ones. The successful operation of the trucks and the demand for them justified the equipment of an independent plant for their manufacture.

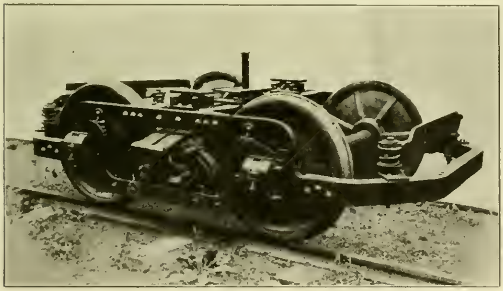
Standard Motor Trucks—Type C-35 Truck for City Service.

The Standard Motor Truck Company, of Pittsburg, has been recently organized and incorporated, and a large plant at New Castle, Pa., has been purchased. This plant is now being equipped with machinery especially designed for the manufacture of these trucks. The plant will be ready for operation about August 1, 1906.

In the manufacture of these trucks the material used is open hearth rolled steel, but as such steel cannot be welded without reducing its strength and durability, it was necessary to design trucks which should have no welds in their frames. The brake rods, which have to be welded, are made of iron.

In all of the trucks the journal boxes are rigidly connected by bars which are bolted to them, and the journal bearings are a close fit in the boxes. Hence there can be no movement of the wheels towards or away from each other, which feature prevents the car from being propelled by the motors pushing the rear wheels against the brake shoes.

All of the trucks are provided with a form of brake hanger, which consists of two links with bolts at each end. A small, stiff coil spring is placed on each bolt of the hanger, which forces the eyes of the hanger links against the bracket at the top and against the brake head at the bottom. This arrangement greatly increases the life of the hanger, eliminates much of the rattle and prevents the brakeshoes from dragging on the wheels. When release springs are connected to brakebeams they usually cause two shoes on each truck to drag on the wheels, and consume power. For this reason the release springs have been connected to the top brake rods. The use of the coil springs on the brake hanger bolts resulted in the development of an automatic turnbuckle, which takes the place of the bottom brake rod, and holds the brakeshoes at a fixed distance from the wheels till they are worn out.



Standard Motor Trucks—Type O-50 Truck for City Service.

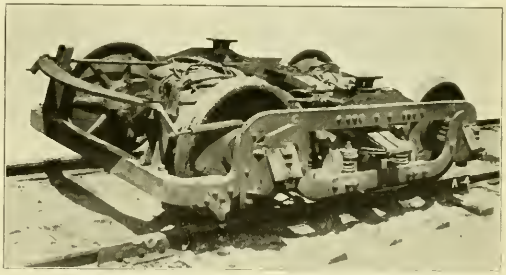
In the double trucks the shoes are suspended from brackets which are carried by the equalizer bars, so that the shoes are always at a fixed height on the wheels and the car may be braked as well with a full load as with a light one. Both types of double trucks are provided with swinging bolsters, with the bolster hangers so constructed as to prevent all wear in the eye of the hanger or on the pin. In order to check the excessive swing of the bolster which takes place when the track is imperfect, a very simple friction device is provided. This consists of a single leaf, U-shaped spring, which is bolted to the bottom of the bolster at its centre and has its ends pressing against the transoms. This device greatly improves the riding quality of the trucks and permits them to be driven at higher speeds around short curves without swinging. The elliptic springs in the bolsters are so designed that the number of leaves in contact with each other is never more than four. These springs are made over 35 inches long, in order to give as large a deflection as possible under the load, and no leaf is more than 7-16 inch thick.

The coil springs which support the truck frames are located between the equalizer bars, and rest upon spring seats cast to the journal boxes. This seat is carried by a bolt which passes through both of the equalizer bars and the seat below the spring. The spring is made comparatively short, so that the action of the brakes and motors will not deflect it from the vertical enough to allow the journal boxes and jaws to come in contact with the pedestal part of the frame, so as to cause wear of these parts. By this arrangement the wear on the pedestals and journal boxes is eliminated.

On the C-60 type of truck M. C. B. journal boxes, journal bearings and wedges are used. The axle journals can be either of the M. C. B. form or the end motion may be prevented by forked check plates. The O-50 and C-35 types are provided with forked check plates, made extra strong.

In all of the trucks the lids of the journal boxes are held in place by strong springs. This spring is fastened to the lid at a point near its centre, so that all sides of the lid are held firmly in place. The spring is fastened in a dustproof slit in the box below the lid. When the lid is open the spring acts as a hinge to carry it.

In order to prevent the car sills from bending down at the ends and to avoid the use of truss rods connected to the car sills, the single truck was designed to carry the greater part of the weight of the car body on the elliptic springs at points near the platforms. A small part of the weight of the car is carried on the coil springs which pass through the side frames and rest upon the journal boxes. Another object in the design was to prevent the galloping of the car when running upon an uneven track. This object was accomplished by placing the elliptic springs far apart in order to make the car body springbase as long as possible. The damping effect of the elliptic springs is thus given a greater leverage to overcome the galloping of the car. Most of the galloping of single-truck cars takes place upon the journal box springs, which have a short springbase equal only to the wheelbase. In order to increase this springbase, the truck frame is supported upon diagonal truss rods which carry the frame upon short stiff springs located at the upper ends of the diagonal truss rods. This arrangement makes the springbase very long. Only a small part of the weight of the side frames is carried on the coil springs. The journal boxes form the vertical tension members of the truss, and the truss rods and diagonal braces tie the journal boxes rigidly together, so that the wheels can have no movement towards or away from each other. The rigid connection between the journal boxes makes the operation of the brakes much easier, as the boxes will not move when the shoes are applied to the wheels. As the journal boxes are not carried between pedestals there are no parts to wear out. This truck can be driven at high speed over a track having very low joints, without galloping.



Standard Motor Trucks—Type C-60 Truck for Suburban Service.

TWO TYPES OF DERAILERS.

The Hayes Track Appliance Company, Geneva, N. Y., is placing on the market two types of derailers, a lifting derail for operation either in an interlocking plant or by pipe line from the main track switchstand, and a pivot derail for hand operation.

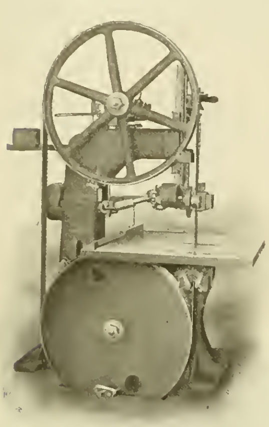
The lifting derail consists of two malleable castings, one of which is a guide-box resting on two ties spaced 10 inches apart and the other a derail block which fits in the guide-box. When the derail is open the block rests on the head of the rail; when it is closed all parts are low with respect to the rail and there is ample flange way with the main rail unbroken. When the derail is halfway open a passing wheel will not be derailed, but will shove the block away from the rail. The lifting derail is made in one size which will fit any T-rail from 4 to 6 inches high. With this type the capacity of a sidetrack may be utilized to its full extent as the derail may be placed close to the clearance point.

The pivot derail is for hand operation only and cannot be used with a switchstand or pipe line. It consists of two malleable castings joined by a ⅞-inch, cold-rolled steel pin. The lower casting or guide-box is placed between the rails on two ties spaced 10 inches apart and is not fastened to the rail. The thrust of a wheel striking the derail block is carried directly to the tie by the seat in the guide-box, the seat holding the derail block firmly in place.

A NEW TYPE OF BAND SAW.

A new band saw has recently been placed on the market by the J. A. Fay & Egan Company, Cincinnati, O., to take the place of its No. 1 machine. The new machine, which is illustrated herewith, is listed as No. 180. It has a considerable range of work, being able to care for material 24 inches wide and will take 12 inches under the guide. The feed-rollers are placed close together so that short pieces may be fed in a satisfactory manner. The saw guides have hardwood blocks so arranged that the slightest wear may be taken up.

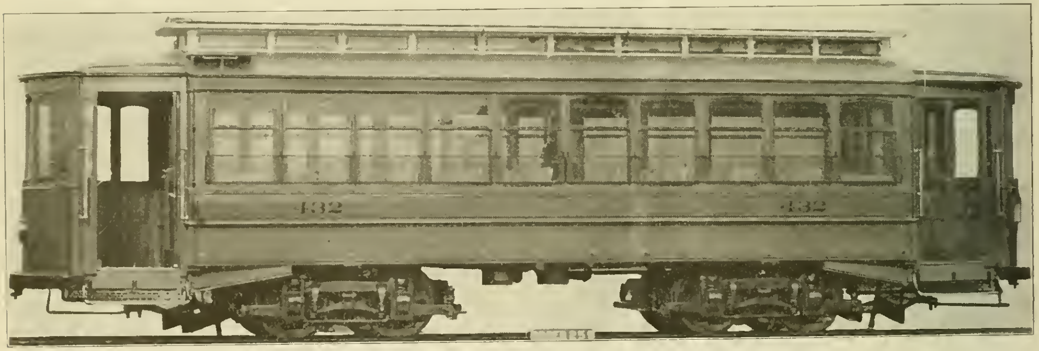
The company's straining device which is used on this machine has been brought to a high point of efficiency and has forward, backward and side adjustments. This device protects the lightest blades when running at high speeds and greatly increases the general usefulness of the machine. The company claims that this saw will be found economical and satisfactory for all kinds of general ripping such as is necessary in shop work.



Fay & Egan Band Saw.

SEMI-CONVERTIBLE CARS FOR ROCHESTER.

The Rochester (N. Y.) Railway Company owns 85.5 miles of track and operates under lease an additional 63 miles. More than a quarter of the mileage within the city of Rochester is operated over tracks which are located between the curb line and a line of trees, thus preventing the use on many of these lines of the ordinary cross-seat, outside-step open car. Only 20 such cars are used in Rochester, and these can be operated on but three of the lines. On the other lines center-aisle cars are used and the management states that it has found the semi-convertible car especially adapted to its operating conditions. The railway company has at the present time in operation or under contract about one hundred cars of the semi-convertible type.



Type of Kuhlman Semi-Convertible Car used in Rochester, N. Y.

For park service on the line connecting Genessee Valley Park and Seneca Park, 15 single-truck center-aisle open trail cars pulled by single-truck closed motor cars, are operated. These trains each have one motorman and two conductors.

At the end of last year the G. C. Kuhlman Car Company shipped 20 semi-convertible cars constructed under Brill patents to the Rochester Railway Company. This railway company has recently placed an order with the same builders for 25 additional cars of a similar type, one of which is shown in the accompanying illustration.

The semi-convertible cars measure 28 feet over the end panels and 39 feet over platform crown pieces; width over sills including panels 7 feet 6½ inches; width over posts at belt, 7 feet 9 inches; height from rail over trolley board 11 feet 8 inches; size of side sills 4x7¾ inches plated with ⅜x12-inch steel; size of end sills 5¼x6⅞ inches; thickness of corner posts 3¾ inches; thickness of side posts 3¼ inches; sweep of posts 1¾ inches. The cars are finished in natural cherry, and the ceilings are of decorated 3-ply birch veneer. Brill seats upholstered in rattan are used. The car fittings include Brill patented sand boxes and alarm gongs. The cars are equipped with the Brill 27-G1 trucks with 33-inch wheels having a 2¼-inch tread and a ¾-inch flange. The axles are 4 inches in diameter. Motors of 25 horsepower capacity are used.

SINGLE-PHASE EQUIPMENT FOR THE RICHMOND & CHESAPEAKE BAY RAILWAY COMPANY.

It is announced that the Richmond & Chesapeake Bay Railway Company will equip 15 miles of track between Richmond and Ashland, Va., for single-phase operation. Contracts for the equipment have been let to the General Electric Company. Current will be furnished by the Virginia Passenger & Power Company. Two generating sets will be furnished, both to be operated ordinarily by water-power, but also arranged to be electrically driven. The first unit will consist of two 750-kilowatt, 3-phase generators, one wound for 6,600 volts, 25 cycles, and the other for 2,300 volts, 60 cycles, with armatures mounted on a single shaft, which will have an extension at one end for connection with a water-wheel. The second set will be made up of a 25-cycle, 6,600-volt generator mounted on the same shaft with a 750-kilowatt, 550-volt, direct-current machine, and also driven by a waterwheel. When there is not sufficient water-power to drive all the machines the sets will be disconnected from the wheels and operated as motor-generators. The 60-cycle generator will then run as a 60-cycle synchronous motor and the 550-volt machine will operate as a direct-current motor. Current for driving the motor end of the 25-cycle sets will be obtained from the engine-driven units of the Virginia Passenger & Power Company, already installed.

A lighting station will be installed at Ashland, the equipment for which will consist of a 3-phase generator mounted upon a common base with a 150-horsepower induction motor. The overhead construction will be of the catenary type and current will be fed to the trolley at 6,600 volts. Each of the cars will be equipped with four G-E single-phase motors and the Sprague-General Electric system of multiple-unit control. The air-brakes used will be of the combined straight and automatic type.

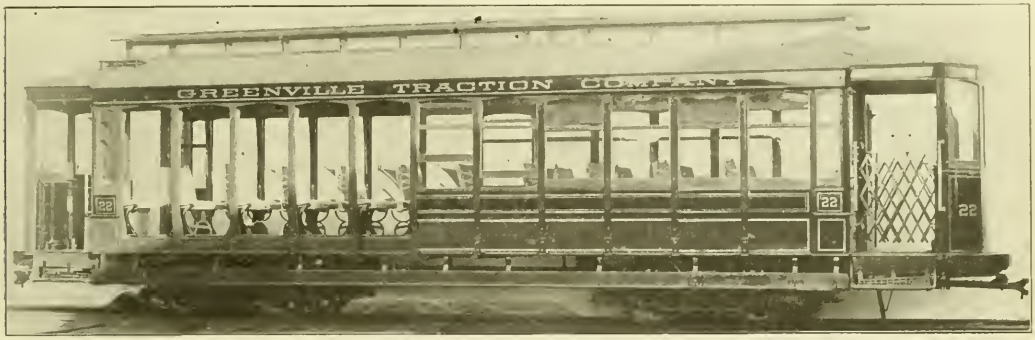
BRILL CONVERTIBLE CARS FOR GREENVILLE, S. C.

The Greenville (S. C.) Traction Company operates a line 12 miles long extending through a thickly settled suburban district with a population of about 30,000 people. Current for the operation of the line is purchased from the Greenville Gas & Electric Light & Power Company, which uses steam power at present but will change to water-power in the near future. The railway company has erected a new barn to accommodate some cars recently purchased. The rolling stock includes 19 cars, all of Brill manufacture. In addition to the new full-convertible cars for this road which have recently been received the company operates four cars of the semi-convertible type each seating 40 passengers.

The new full-convertible cars are of the following dimensions: length over end panels, 30 feet 11 inches; length over crown pieces, 40 feet 4 inches; width over sills including panels, 8 feet 2¼ inches; width over posts at belt, 8 feet 6¼ inches; sweep of posts, 1¾ inches; centre to centre distance of posts, 2 feet 7 inches; size of side sills, 8x6x⅞ inches; size of end sills, 4¾x7¾ inches; thickness of corner posts, 3⅝ inches; thickness of side posts, 3⅜ inches.

A feature of the car is the "Narragansett" step which provides two steps within the overall limits of one. This feature is especially desirable for excursion travel when women and children constitute a considerable portion of the passengers carried. The step is formed by an extension to the lower outward-extending flange of the Z-bar sill making an upper step 8½ inches wide.

The posts are secured to the sills by malleable iron brackets through which they are bolted and are also held by strap-bolts through the lower flange. The cars are finished in natural cherry with ceilings of decorated birch. The seats are of Brill manufacture upholstered with cane and numerous other Brill patented specialties are used throughout the cars. The cars are mounted on Brill 27-G1 trucks with 33-inch wheels, a 4-foot wheelbase and axles 4½ inches in diameter. Each car has two motors of 50-horsepower capacity.

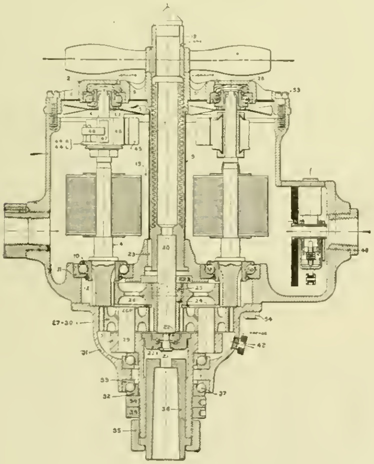


Full-Convertible Car for Greenville, S. C., with Part of the Panels Removed.

DUNTLEY PORTABLE ELECTRIC DRILLS.

The Chicago Pneumatic Tool Company, manufacturers of the Duntley portable electric drill, believe that the success of these drills is due to their ability to perform the work for which they were designed with the greatest dispatch and the least consumption of energy, also to the ease of manipulation and the freedom from liability to break down under hard usage and rough handling.

The drills are built in three distinct types, each adapted to its own particular class of work, but all embodying practically the same mechanical features, differing only in the design and general arrangement of the electrical parts. These three types are known as the single-motor, 2-motor and 2-motor drills, respectively. The single-motor drill which the manufacturers consider adapted to all classes of general work for drilling in iron and steel up to 1¼ inches in diameter is as its name would signify, provided with one revolving electrical element or armature. The single-motor drills range in size from ⅜-inch capacity for the breast drill up to 1¼ inches capacity. The magnetic field casing is a steel casting of high permeability to which are bolted drop-forged pole pieces. The armature is of the slotted type, with hand-wound coils of double silk covered magnet wire secured in place by means of wedges, no binding wire being used. The commutator is built up of hard-drawn copper bars, insulated with the best grade of amber mica, and the commutator sleeve is of machinery steel. The shaft is of high carbon steel with the pinion cut as an integral part of it and is hardened and ground at the bearings. The bearings are of the most approved ball type with provision for slight end play of the armature. Carbon brushes are used.

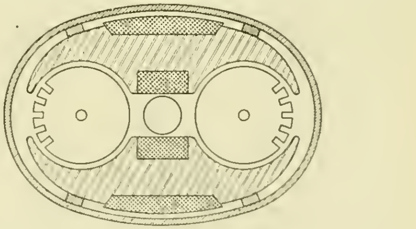


Duntley Portable Electric Drills—Section of Two-Motor Drill.

The handles are of round, hollow pipe located near the line of centre of gravity of the drill and the flexible leading-in cable is passed through one of these handles. A special quick-break switch is mounted in the drill housing at the base of one of the handles and is entirely protected from external injury. The switch cuts off all current entering the drill, including the shunt field current, which in some foreign makes of drills is broken only at the cable socket. A reversing switch is furnished when so ordered and is arranged so that the drill cannot be reversed without first throwing off the current by pushing the "off" button on the switch. The breast drill and the drill known as 1-M-1-10 have capacities of ⅜ inch and ½ inch in iron, respectively, and are shunt wound, while the larger drills are compound wound.

There is a diaphragm carrying the lower ball bearing and serving to separate the electrical from the mechanical transmission so as to exclude all oil from the windows. The planetary gear which it is stated was first introduced in the Boyer air drills manufactured by the Chicago Pneumatic Tool Company, is designed to bring into action two teeth of the pinion; to balance all strains on the bearings and to produce a symmetrical tool with all of the strains in one straight line between the point of the drill and the point of the feed screw. The drill spindle has a ball thrust bearing located at the base of the gear case casting.

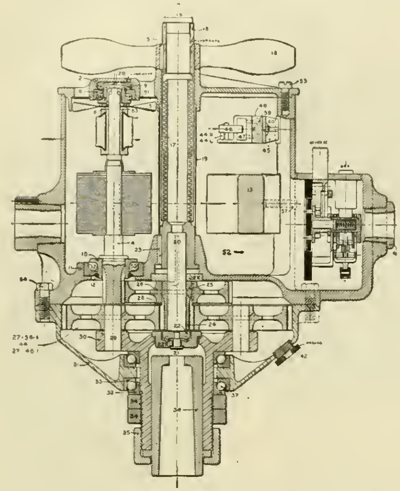
Provision is made for the application of grease to the gears which are all hardened by special process. The gears when running at their normal peripheral speed of about 475 feet per minute are absolutely noiseless and on a drill capable of drilling 1¼-inch holes in iron or steel, the energy required to drive them up to this speed empty is about 18 watts or 1-40 of a mechanical horsepower. The total energy required by this drill running empty at full speed is 83 watts or 1-9 horsepower, including all mechanical and electrical losses. The temperature rise of the drill after 10 hours full load service will not exceed 35 degrees C, or 63 degrees F, above the surrounding air. This is accomplished by the excellent electrical design in connection with a special ventilating system which keeps a stream of cold air pouring through the windings at all times. A fan is provided on the armature shaft and revolves at the speed of this shaft, which is comparatively high and imparts a good velocity to the air. With the larger drills of this type working on 1½-inch holes in good cast iron, 1 cubic inch of metal per minute can be easily removed. This is equivalent to 1 inch in depth per minute of 1¼-inch diameter.



Duntley Portable Drills—Armature and Field Plan—Two-Motor Drill.

For drills capable of drilling holes larger than 1¼-inch diameter, if one armature is used the armature becomes quite large in diameter and the speed must necessarily be reduced to keep down the peripheral velocity. It is for this larger work that the 2 and

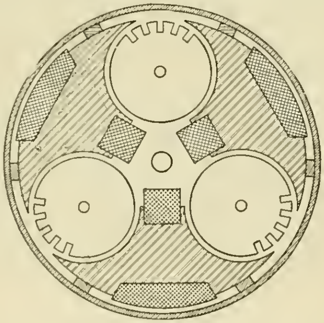
3-motor drills become desirable. By the use of two or three small armatures properly geared to the main driving spindle, a greater power can be secured for a given weight on account of the higher speeds that the armatures can be run at with perfect safety. This seeming complicity of parts is made perfectly simple and free from liability to trouble by the special design and the superior construction used on these drills. In accompanying engravings are shown sectional views of the 2 and 3-motor drills, the construction of which is somewhat analogous, similarity to some extent being shown by two other engravings of the plan arrangement of the armatures and fields which are peculiar to the Duntley drills.



Duntley Portable Electric Drills—Section of Three-Motor Drill.

The outer casing is of non-magnetic material. It will be noted that the magnetic-flux in each drill is in series through the armatures, thus insuring the same speed for all three armatures (or two, as the case may be).

The fields are compound wound, and a very low starting current is required, and at the same time a fairly close speed regulation is obtained. The fans are placed on the upper or commutator ends of the armature, and the air is drawn in here and forced out at the lower end. The electrical construction of the parts, including the switch, is the same in general as for the single-motor drills previously described. The planetary gear arrangement is similar, involving only such modifications as are made necessary by the increase in the number of driving pinions.



Duntley Portable Electric Drills—Plan of Armatures and Fields—Three-Motor Drill.

The 2 and 3-motor drills are, as previously stated, adapted to heavy drilling and are used for drilling in iron or steel up to 2¼ inches and for boiler plate reaming and stay bolt tapping. On large holes they have removed 2¼ cubic inches of cast iron per minute with comparative ease.

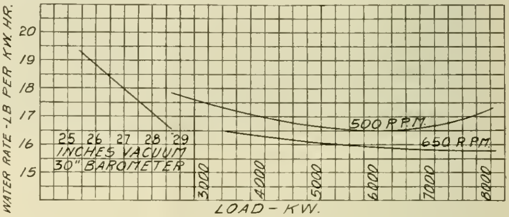
Freight Service for the Illinois Traction System.

It has been announced that the Illinois Traction System is making preparations to install a freight service on the lines between Springfield and St. Louis in which the freight will be carried in long trains pulled by electric locomotives instead of in single cars.

TEST OF A 5,000-KILOWATT STEAM TURBINE.

In March, 1906, a series of tests was made on a steam turbine that had been in commercial service for about one year in the Fisk street station of the Commonwealth Electric Company, Chicago, Ill. The tests were conducted under the supervision of the firm of Sargent & Lundy, representatives of the purchaser, and representatives of the turbine manufacturer. The generating unit tested is one of four similar units at this station and consists of a 5,000-kilowatt Curtis turbine, direct connected to a 6-pole, 3-phase, 5,000-kilowatt, 9,000-volt, 500 r. p. m. revolving field generator built by the General Electric Company.

All the tests, except those for speed, were made under regular commercial load conditions. On account of the change in frequency during the speed tests, the load was absorbed by a water resistance. It was found that the commercial load water rate was identical with that obtained by use of a water rheostat, other conditions remaining the same. The instruments used were carefully calibrated. The load readings were recorded at intervals of two minutes. All tests were made at about 150 degrees F. superheat, the temperature being read by calibrated mercury thermometers. Temperatures and pressures were recorded every five minutes. The amount of steam used was obtained by weighing the condensed steam. After each run the condenser was tested for leakage, which was found to have been small.



Load and Vacuum Curves for 5,000-Kilowatt Curtis Steam Turbine.

Table.

The results of the test when reduced to standard conditions are shown by the accompanying table and curves:

Load	Percent of	Water Rate in lbs.	per Kw. Hour.
in K. W.	Full Load.	500 R. P. M.	600 R. P. M.
2,500	50	17.74	.....
3,750	75	17.08	16.35
5,000	100	16.62	16.07
6,250	125	16.52	15.88
7,500	150	16.90	15.80

150 degrees F. Superheat; 1½-in. Back Pressure; 175-lb. (gauge) steam pressure.

ELECTRICAL EQUIPMENT OF THE ERIE RAILROAD.

It has been announced that the directors of the Erie Railroad have authorized the immediate electrical equipment of the division of the road between Rochester and Mt. Morris, a distance of 35 miles. The company's electrical board, which is composed of J. M. Graham, B. J. Arnold, A. B. Stillwell and A. E. Williams, has had the matter under advisement for some time and has reported favorably upon the project. Contracts for this work have been placed with Westinghouse Church Kerr & Company. The board has decided to adopt the Westinghouse single-phase, alternating-current system. The preliminary contract calls for the equipment of a transformer station and the installation of seven electric cars. These cars will be operated by four 150-horsepower single-phase motors to one car. The line construction will be of the catenary type. The cars will be used to haul freight as well as passengers. Current for the operation of the road will be obtained from the plant of the Niagara Falls Electrical Transmission Company.

NEW WORK AT HAVANA, CUBA.

The city of Havana, Cuba, is well equipped with electric railways. The city lines are operated by the Havana Electric Railway Company, while the interurban service between Havana and the surrounding towns is handled by the Havana Central Railway Company. These companies are developing rapidly. The equipment for both the present and additional rolling stock and track material is of American manufacture. The rolling stock of the last mentioned company includes ten 40-ton General Electric locomotives for freight and 25 motor cars for passenger service.

The Havana Central is preparing to supply a lighting service to the cities of Guines, Guanajay, San Jose and Regla, making use of the present transmission system and constructing substations at the towns mentioned. The substations are each to be provided with an induction-motor, alternating-current generator set, which will regenerate the present 25-cycle, alternating current into one having a frequency of 60 cycles. The complete substation apparatus will be furnished by the General Electric Company.

In addition to the fixed substations two complete portable substations will be constructed. These will be mounted on freight trucks so that they may be transferred to points where there is a heavy local demand for current. These developments are of interest particularly since they are taking place in a country which has adopted electricity within a comparatively short period.

Electric Railway Review

PUBLISHED MONTHLY BY THE WILSON COMPANY, CHICAGO

NEW YORK: 150 Nassau Street CHICAGO: 1060 Monadnock Block PITTSBURG: 510 Frick Building

Subscription Price, $1; Foreign, $3; Single Numbers, 10 cents

Entered at the Post-Office, Chicago, Ill., as Second-class Matter

VOL. XVI AUGUST, 1906 No. 8

Keep in Touch with the Public.

A vice-president of a large steam railway system recently expressed himself as envying the ability of electric roads to keep in touch with the public and to increase revenues by catering to ever varying needs. He admitted frankly that the high officials of most steam roads are too unfamiliar with local conditions; that too many generalizations are drawn from too few particulars. The tendency of steam railroad men who go to electric roads is to introduce the same elaborate methods that have necessarily been developed on the larger properties. This can easily be carried too far. The greater the simplicity of method, the more satisfactory are the results.

Good Schedules as Moneymakers.

Much depends on the man who makes the schedules for a city railway property. His ability to adjust schedules so that all cars will be well filled often determines whether the finances of a road shall go up or down the scale. The cost for car-hours, when compared with the cost for power is such a large part of the operating expense that it would seem wise, in the instances of many roads, to devote more time to the question of how to keep just enough cars on the streets, rather than strive to cut off a fraction of a percent from the cost of current at the power house. Illustrating this argument, a new manager was appointed at a time when one of the large city properties was falling behind more than a million dollars a year. About his first official act was his sending to the barns half of the cars necessary for the then existing schedules. This caused general dissatisfaction on the part of the public and when complaints were referred to the manager he replied that the company had a special department with a competent head whose duty it was to see that there always were seats available for passengers desiring transportation and that enough cars to furnish these seats and no more would be operated. He also stated that as fast as the people wanted to ride, his company would be glad to offer them seats in its cars, but there would be no handling of empty cars. Thus trimming the schedules, coupled with other reductions in operating costs, resulted in dividends at the end of the first year of operation under the new management and the road had been placed on a firm standing.

Getting Traffic Data.

In planning city schedules there are many conditions that call for an especially close study of where people are riding. A large amount of the necessary information for use in such study may be obtained from the ordinary trip reports of conductors as tabulated in the auditing departments, but when it is desired to know on what parts of any single line the cars are crowded so that the routing of other lines may be changed to relieve this congestion, the necessary information is more difficult to get. If it is the practice to record both fares and transfers a load curve for any line may be had by requiring conductors to record the register readings at definite points along their runs; but if, as is the case with many roads, the fares alone are registered the problem becomes more difficult and it is then necessary on heavily traveled lines where the conductors have no time to make records, to station men at definite points along the routes and take an actual count for a long enough time to determine a trustworthy average. In Detroit, when it is desired to get the number of passengers handled on any particular part of the lines, a man is stationed at both ends of the section, if such a section is in the middle of the line, and at the beginning of a section if it runs to the end of a line. This man records the date, direction, car number, time and number of passengers on the cars as they pass him. His record sheets are then sent to the department of schedules and mileage and the information entered daily on a large sheet so that the data may be totaled and averaged. When there is any special event that draws a large crowd to one locality, which crowd will desire to return at one time, a man is stationed so that he can count the passengers alighting from the cars and the results of the count are used as a basis for deciding upon the number of extra cars required to take home the crowd. In ordinary operation a book for recording the number of passengers as shown by the register is kept at each car house, this information usually being observed for the morning and evening rush hours. These records are found of value in deciding upon the proper tripper service for new schedules.

Steam vs. Electric Interurbans.

Elsewhere in this issue appears a description of the property of the Evansville & Mt. Vernon Electric Railway, which recently started operating in southwestern Indiana. The line passes through a prosperous and thickly populated section which should afford a good passenger and freight business. The line, between its terminals, also parallels the steam road of the Louisville & Nashville Railway. The condition of parallel steam and electric roads obtains in many localities, but in this instance it gave rise to a rather unusual move on the part of the steam railroad. As soon as the work of construction of the electric line had advanced to a point where its operation was assured, the Louisville & Nashville placed in operation an interurban train consisting of an engine and one passenger coach which has since maintained a two-hour schedule between Evansville and Mt. Vernon, the rate of fare being reduced to 35 cents for the single trip or 65 cents for the round trip. The electric road has made a rate of 40 cents one way and 70 cents for the round trip between the same two points. The interurban has not thought it necessary to meet the steam rate because it offers its patrons transfers to the city line in Evansville and has its terminal in Mt. Vernon at the public square, whereas, the passenger stations of the steam line are located at some distance from the business portions of the two cities. The electric line will also eventually offer its patrons a 60-minute schedule as against the two-hour headway maintained by the steam road. It is reported that so far the patronage of the electric line has shown a daily increase and that the travel on the steam line is gradually decreasing. In view of the general interest manifested throughout the country in the results of the competitive parallel operation of steam and electric lines, the outcome of this contention should be of interest to interurban operators. An earlier instance of competitive steam and electric operation occured a short time ago in Illinois. In this case the opposing interests were the division of the Illinois Traction System between Bloomington and Decatur and the Illinois Central Railroad. During the construction of the Bloomington-Decatur division the Illinois Central commenced the operation of interurban steam trains between Bloomington and Decatur, which stopped at all highway crossings. Within a short time after the electric cars began running the steam road abandoned its interurban trains, owing to a lack of patronage.

A Ten-cent Ride for Five Cents.

An argument published elsewhere in this issue in opposition to the attempt of the Borough of Brooklyn to establish a five-cent rate of fare for so-called Coney Island business, brings to mind one of the peculiarities of human nature which must be reckoned with to an increasing degree with the expansion of electric railway systems. This peculiarity is the tenacity with which the public mind holds to the notion that in some way or other a railroad under electric operation should be able to carry a passenger as far as he may desire to ride for a single five-cent fare. It matters not that the same service has previously been performed by a steam road and that three or four times the amount of fare has been unquestioningly paid—this, too, under conditions that for pleasure travel, at any rate, are generally considered less satisfactory. The habits of past experience are forgotten; knowledge of the paying or non-paying qualities of the service as an all-the-year-round business is at once laid aside; the only notion remaining that betrays evidence of vitality is: "One ride, one fare." Without assuming to pass judgment upon either side in the case which has suggested these remarks, it is submitted that there is no inherent reason why a service by an electric road should of necessity command a less rate of fare than a similar service performed by a steam road. On the other hand, and from the viewpoint of a municipality seeking the benefit of its constituents, there are certain advantages incident to electric operation that did not obtain under the former system of service. These points are brought out in the argument referred to. They consist especially in the continuation of the single-fare zone to the outskirts of the city, thereby assisting in the permanent development of this zone; while the second fare is only applied to what may be considered a special service which covers a brief portion of the year only, which is intended purely for the accommodation of pleasure travel and which is of necessity carried on under conditions calculated to be relatively of little pecuniary advantage to the company. Yet the ghost of a single fare for a single ride will not down and appears to find especially congenial haunts around municipal council tables.

Underground or Overhead Bridge Loop.

The question of relieving the traffic congestion at the Brooklyn and Williamsburg bridges in New York by an elevated or subway loop connecting the Manhattan terminals of the bridges. to pick up Brooklyn passengers en route instead of in the mass as at present, has again been deferred until fall. The entire problem, which has occupied the attention of the Rapid Transit Commission and the board of estimate and apportionment for several months, and which has proved a bone of contention for municipal art societies on one side and angry citizens desiring transportation on the other, was on July 26 set aside until September by the plan and scope committee of the Rapid Transit Commission, to which it had been referred by the board of estimate. The need for the immediate construction of a loop of some sort has long been recognized, but a subway is considered by many impracticable at present for various reasons, while the elevated plan has been strongly opposed from the start by those who dislike to see the streets disfigured by an elevated structure. Bridge Commissioner Stevenson's plan for an elevated loop to be built by the city in Delancey street and the Bowery was discussed at a meeting of the board of estimate on July 6, and although a majority of the board was understood to be in favor of it, a parliamentary squabble caused the matter to be tabled until the return of Mayor McClellan from Europe in the fall. Immediately following this meeting Comptroller Metz addressed a letter to the Rapid Transit Commission advocating an elevated loop as a temporary makeshift until the complete plans for subway routes in Brooklyn can be worked out, and requesting the commission to take action on its own initiative toward laying out a rapid transit loop. Mr. Metz's letter was referred to the committee on contracts, which decided to await a request by the board of estimate but directed Chief Engineer Rice to begin work at once on the preparation of plans. On July 16, at the request of President Coler of the Borough of Brooklyn, Acting Mayor McGowan called a special meeting of the board of estimate for July 19 to reconsider its action postponing a settlement of the question until fall. The board of estimate met and adopted a resolution offered by President Ahearn, of the Borough of Manhattan, which threw the entire responsibility upon the Rapid Transit Commission by requesting it to decide whether such a rapid transit loop should be constructed and whether it should be a subway or an elevated road. On July 26 the plan and scope committee of the Rapid Transit Commission instructed Chief Engineer Rice to prepare estimates during the summer as to the comparative cost of the elevated road and the subway with an estimate of the time required to build each, and to report to the commission at its meeting the first week in September, when the report will probably be referred to the board of estimate. In the meanwhile the municipal beautifiers may congratulate themselves on having saved the streets from defacement, and the citizens of Brooklyn may wait for their cars and their cold suppers.

Transmission Line Experience.

At the present time many transmission lines which were built some few years ago are in process of having new material substituted for that in the original construction. On some lines these changes are made because the increased load necessitates raising the operating pressure. Other lines must be rebuilt because of the natural wear and tear to which they have been subjected and so that better protection from lightning can be afforded. An interesting change is being made in the transmission line of the Guanajuato (Mex.) Power & Electric Company, brought about by a desire to increase the capacity of the line and afford better protection from lightning troubles. This transmission network consists of 110 miles of main trunk line carrying current at a difference of potential of 60,000 volts between the wires of a three-phase circuit. From the trunk line current is transmitted to outlying lines through the medium of step-down transformers and secondary transmission lines operated at 15,000 volts pressure. The conductors consist of three No. 000 cables mounted on steel towers so graded that the wires average 40 feet above ground. These towers are set 12 to the mile. Heretofore the transmission wires were supported on the towers with one current wire tied to a saddle insulator on the top of the tower and the two other wires at the extremities of a horizontal cross-arm which forms the base of a triangle. In the reconstruction work it was thought necessary to provide better protection against lightning and so the wire heretofore carried to the top of the pole has been brought down to a distance below the cross-arm equal to its former distance above. In its new position the wire is supported by a steel bracket secured to the side of the tower. As a protection against lightning the space made vacant by the removal of the transmission wire from the top of the pole to the side is now occupied by a ¼-inch stranded steel cable grounded at frequent intervals. The use of such a cable, although when earlier advocated it was objected to by many on account of the steel wire offering an element of danger to the continuity of operation should it be broken by high wind, seems to be growing in favor as is evidenced by its use in various parts of the country under differing conditions as to electrical storms.

Moisture and Insulators.

In localities where fogs and rapid changes in temperature are prevalent the design of high-tension insulation must be such that ample creepage surface will be afforded. Some of the coast lines of California which are troubled with sudden fogs from the ocean have protected their insulators by so-called "fog boxes" which serve to collect a portion of the moisture which would otherwise cover the petticoats and afford a convenient path for discharges between the conductors and the insulator pins. One of the reasons why it was necessary to increase the size of the insulators on the Guanajuato Power & Electric Company's transmission line in Mexico, was on account of the after effects of condensation caused by the sudden changes in temperature. The moisture collecting on the petticoats of insulators under such conditions so lessened the leakage surface, which under ordinary rainy-weather conditions was amply large, that insulators designed for nearly twice the operating voltage are being used. It seems that the natural conditions in each part of this country and others offer some element which calls for actual operating experience with currents at high voltage before any one type of line construction can be operated with assured continuity.

Reducing Damages by Profit Sharing.

The United Traction Company, of Albany, N. Y., operating lines in Albany and Troy, recently took a step in the right direction when it inaugurated a plan which it is believed will greatly reduce its accident damage claims during the coming year by making the employes more than ordinarily careful in the handling of cars and passengers. The company paid in damage claims during the year ended June 30, 1906, approximately $75,000. Under the new plan 75 per cent of any reduction there may be from this amount during the year beginning August 1 will be distributed among the conductors and motormen who have a clear record for the year so far as accidents caused by their own negligence are concerned. Only employes who shall have worked for the company a full year are to participate in the distribution, which will be in proportion to the amount earned by the employe for the year. The method of distribution is to be decided upon by a committee of three, one of which will be selected from the motormen and conductors. If the scheme proves successful, as it undoubtedly should, the company intends to extend it to other departments, and whenever an employe saves money for the company he will be allowed to share in the benefits.

Chicago Elevated Merger.

Consolidation of the four elevated roads in Chicago, including one fare over all the lines, through routes and relief from the loop congestion, is the plan of Blair & Co., the New York firm which controls the Northwestern and Oak Park elevated lines. The scheme is to form a general holding company. The bonds of the several companies are to remain undisturbed and the stocks exchanged for shares in the new holding company. In a general way this arrangement is satisfactory to all concerned. The hitch has been in the matter of the amount of the allotment. It was recently announced that the Metropolitan company had withdrawn from the merger as it did not consider the price offered for its stock sufficiently high. The Blair interests proposed to give in exchange for the present Metropolitan stock, second preferred and common in the new company. The Metropolitan interests demanded first preferred in exchange for the present preferred shares, on equal terms with the offer made to the South Side Company, except that the Metropolitan expressed a willingness to accept par for its preferred stock while it is understood that the South Side is holding out for 120 in five per cent first preferred stock. The Blair people have declined to consider this proposition.

Position of the Metropolitan.

In analyzing the position of the different elevated lines in Chicago, Adams & Samuel, of the Chicago Board of Trade, have found the Metropolitan company to be in a stronger position at present than any of the other properties. The road is practically completed and it is the only one owning a down-town terminal. It has met the universal transfer and fast electric line service of many surface roads. The Northwestern and South Side companies are making extensions which will entail heavy additional fixed charges. They have practically no down-town terminals and will have to meet the competition of fast electric cars on the trunk lines of the surface roads. For the first five months of its present fiscal year the Metropolitan has shown an increased traffic equal to about the total of the other three roads. The South Side company is the only one of the four which is now paying dividends, but it is said that the Metropolitan is earning fully five per cent on its preferred stock, and it is expected that the company will shortly resume dividends on a three per cent basis. Negotiations for the consolidation of the other three lines have been continued with the hope that the Metropolitan may eventually come in. In view of the strength of the West Side company's position it is not probable that it will agree to the merger on any other terms than equality with the other lines. It is fairly certain that the merger would stimulate patronage and increase the value of all the properties concerned. The cost of operation would be much reduced as but one set of officials and offices would be necessary. From the point of view of the public there is also much to be gained by the merger. It will mean that a passenger can ride continuously from Wilson avenue on the North Side, to Sixty-third street and Stony Island avenue on the South Side, a distance of approximately 16 miles, for five cents. Moreover the present congestion of the loop, which is a problem that weighs heavily upon the Chicago mind, would be much relieved by sending trains but part way around and then out on some other line.

Interchange of Electric With Steam Roads.

The interchange of business between steam and electric roads is in its childhood and there are not many traffic men who are willing to predict how and when it will reach manhood. Here and there prorating arrangements exist, but for freight and passenger traffic, they are not common. This seems to be due largely to the weakness of the interurbans and the hostility of the steam lines. The latter are almost universally hostile because they think they see their own losses in the growth of the business of the electric lines. One of the large traffic associations of the steam roads has among its records a resolution, adopted about two years ago, to the effect that no interchange with the electric lines shall be made. The interurbans are still in their youth and are not strongly united one with another for the waging of war against a common enemy. Generally they have not the command of traffic which would make an interchange arrangement very attractive to the steam lines. Some of the interurbans are built through virgin territory and act as feeders for steam roads which look with favor upon interchange or switching arrangements for this newly developed traffic; but again the interurbans parallel the steam roads and deprive them of their local traffic and here, of course, war exists.

Possibilities of Mutual Interchange.

In these conditions we have the hint of great and mutually advantageous possibilities in this interchange. Even where the steam road is deprived of business its officers admit that the increased through traffic which comes to it by reason of the further development of the territory more than offsets the loss of local traffic, and furthermore the local traffic lost is often that which has been carried by the steam road with considerable difficulty and at little profit. The functions of the two methods of transportation, as a prominent executive has expressed it, are different; the work of the electrics is by frequent stops to gather up and assemble at certain points the small lots, in doing which this form of transportation has proved itself economical; while the work of the steam roads is to cover the long through runs which at the present time at least are economically made with the steam locomotive; but today, notwithstanding the possible advantages to be derived from it, interchange is prohibited by the physical deficiencies of the electric lines in track and equipment. It should be remembered in this connection that the attitude of the steam roads has not encouraged the betterment of these conditions, though in spite of this attitude some of the interurbans, looking toward the handling of freight trains, have avoided steep grades and sharp curves and have adopted standard steam equipment. If the electric roads will develop their field of decentralizing population by encouraging the settlement and the placing of industries along their lines (in which work many of them are now making good progress) their control of traffic would doubtless be such that the steam roads would see the advantages of alliances with them for the further development and economical handling of this traffic.

Interurbans are Common Carriers.

There is another way in which prorating may possibly be brought about. There is little doubt that the interurbans are common carriers and under the jurisdiction of the Interstate Commerce Commission. The power given the commission to establish through routes and joint rates where these are not voluntarily supplied by the carriers may at some time be invoked by a farmer who is dissatisfied with the sum of the local rates to his market. The problem is complicated by the possibility of the equipment for electric operation of the steam roads and by the possibly successful outcome of the search for some form of motor car to perform economically the function of making local collections and distributions. Years will be required to permit the problem to work itself out and to bring the contending parties to a compromise, each recognizing the other's field of activity.

Rapid Bridge Construction.

In connection with the article describing the construction of the Elgin-Belvidere Electric Railway, appearing elsewhere in this issue, is the description of a steel-concrete bridge spanning one of the streams on the line. In building this bridge a novel method was used. The old idea of the self-sustaining stone arch was used, but the means employed in placing in the arch the component trough-shaped sections, corresponding to the several stones composing a stone arch, was here used for the first time. The most interesting features in the construction are the simplicity and rapidity of the method used. The only falsework necessary was the track supporting the traveler employed in placing the sections in the arch ring. The sections so placed are secured by guy cables and gin poles and after the key section is in place these may be removed and used in the erection of the next arch. Notwithstanding serious delays due to labor troubles the superstructure of this bridge was erected in 30 days. It is not probable that a four-span bridge of a total length of 350 feet could have been erected in such a comparatively short time by the usual method of false work and wooden centering at as low a cost as this structure. The question of the durability of the bridge must, of course, be determined by the test of time, but the initial observations argue well for its future. By means of elevations taken at the crown of each arch rib it was determined that the settlement of the ribs caused by the dead weight of the diaphragms, spandrel walls and floor was an inconsiderable amount. The bridge has been designed with a liberal factor of safety that will no doubt withstand every requirement of interurban traffic. In these days of rapid interurban construction the method here used invites the attention and comment of the practical engineer.

LOW-PRESSURE TURBINES IN POWER PLANTS.

The data on the operation of low-pressure steam turbines at one of the power stations of the Philadelphia Rapid Transit Company, as published on another page of this issue, are of interest as showing what may be accomplished with this type of engine when used to supplement non-condensing plants. When condensing apparatus is installed in a plant originally designed for non-condensing engines the object in view is to increase the output of the engines when working at the cut-off for which they were designed rather than to secure a greater efficiency of the steam by increasing the ratio of expansion with the load on the engine remaining as before. Any gain in efficiency by shortening the cut-off would be offset to a great extent by greater cylinder condensation, so that it is safe to assume that the increase in economy to be expected will be that resulting from reducing the back pressure on the engine, the admission and expansion lines remaining unchanged. The increase in engine output by the addition of a condenser is not far from 30 per cent of the output when operating non-condensing; when the power necessary to operate the auxiliary apparatus for the condensers, cooling towers, etc., is considered the increase in net or available output is about 25 per cent. Under the conditions described this increase in output, in the case of a compound engine, would give an unequal loading for the high and low-pressure cylinders.

A steam turbine designed to utilize the exhaust from a non-condensing engine has the advantages of not affecting the load on the engine, of working the low-pressure steam expansively, and of permitting the vacuum to be carried at 28 inches or better, instead of at 25 or 26 inches which the limitations of the reciprocating engine impose as the minimum pressure practicable. The increase in capacity to be secured by adding a turbine between engine and condenser, under ideal conditions, would depend upon the type of engine, but with compound engines with initial steam pressure at 155 pounds per gauge would be not far from two-thirds of the engine output; taking account of the power needed for auxiliaries the net increase in capacity would be about one-half of that of the engine. As the load on the engine increased there would be more steam supplied to the turbine and the turbine output would become relatively greater.

Theoretical calculations of performance are always accepted with hesitation until their truth has been demonstrated in practice; and the results of operation over a long period under normal conditions are of far greater commercial weight than would be those based on short time tests. Therefore the results secured at Philadelphia are especially interesting since they show a substantial saving in coal, with the turbines operating under conditions which are the most favorable for developing their full capacity.

The figures given show a decrease in coal consumption per kilowatt-hour of station output of over 19 per cent as the proportion of turbine output increased from 5.8 per cent of the total to 23.8 per cent of the total output. Were the turbine capacity at this station increased sufficiently to utilize all of the exhaust steam from the engines it is probable that the increase in output would exceed 50 per cent of engine output, and the coal consumption for the station be reduced to three pounds per kilowatt-hour.

THE COST OF REPAIRS FOR STEAM AND ELECTRIC LOCOMOTIVES.

Some few months ago Mr. J. E. Muhlfeld presented an interesting paper before the New York Railroad Club outlining the results of his unusual experience with large steam and electric locomotives. The main conclusion drawn by the author was that the steam locomotive is more economical than the electric locomotive, not only in cost of operation but in expense for repairs. The two types of equipment compared were the large Mallet articulated compound steam locomotive and the direct-current units, both of which had been operated on the Baltimore & Ohio Railroad. For the particular conditions in which the B. & O. locomotives were operated the conclusions are sustained by the figures presented, but it should not be claimed that these costs have any general application except to services similar to those found on the B. & O. road where the two kinds of locomotives were operated. The figures given for the cost per hundred miles for steam locomotives are for running repairs $3.16 and for shop repairs $2.41, total $5.57. The total cost of operating and maintenance of the steam locomotives during the year is given as $26.90 per hundred miles. For the electric locomotives, running and shop repairs on electrical portion $6.40, and on mechanical parts $5.80, total $12.20 per hundred miles, and the total cost for operating and maintenance during the year $69 per electric locomotive of two sections. The total cost of repairs for the electric locomotives per year is estimated by Mr. Muhlfeld as $2,000 per passenger locomotive and $3,500 to $4,000 per freight locomotive of two sections.

It was pointed out in the discussion of this paper that the operating conditions were favorable to the steam locomotive and unfavorable to the electric, the former was comparatively new and the cost of repairs taken during the lowest period of its first year's service, while on account of the absence of boiler and firebox in the electric locomotive its repairs are likely to be more uniform from year to year. The cost of maintenance and repairs for the B. & O. electric locomotive after completing a service of 30,000 miles was 12.2 cents per mile and this may be compared with that recently reported for the New York Central electric locomotive which has just completed its 50,000-mile endurance test hauling 200 to 400 tons at high speed, involving higher braking and accelerating duty than is found in regular operating service. The cost of maintenance for this locomotive, including brake shoes, tires, inspection and miscellaneous items, is given by the General Electric Company as 1.26 cents or only about one-tenth that reported by the B. & O., each locomotive being of the direct-current type, but of entirely different construction. It is quite probable that the detail accounts are not alike and that the General Electric figures do not cover as complete a specification as the B. & O.

The figures given for repairs to steam locomotives, 5.57 cents a mile, are remarkably low for so large a locomotive, but they will increase rapidly in the next two or three years of service up to the time of firebox renewals and general repairs. Mr. Muhlfeld says he expects this cost to reach 9 cents per mile when such repairs are required. Where boiler repairs are heavy the cost of repairs for large steam locomotives as found in the annual reports of railroads is now 15 to 20 cents per mile. In the discussion of Mr. Muhlfeld's paper, Mr. H. H. Vaughan suggested a general rule that railroad equipment of the same value will cost about the same to maintain whether locomotives or cars, thus if a $10,000-locomotive costs four cents per mile, one costing $20,000 should cost eight cents per mile, and one costing $30,000, 12 cents per mile. According to this rule a Mallet locomotive like that on the B. & O., which would probably cost, new, $30,000, should cost on an average per term of years at least 12 cents per mile, and this is about the same as is given for the two sections of the B. & O. electric locomotive.

It does not seem reasonable that this rule should apply very accurately to the electric locomotive as there must be more wear and breakage in the unbalanced parts of reciprocating engines than in machinery like the electric motor, where the machinery rotates and is perfectly balanced.

In estimating the relative cost of repairs for steam and electric locomotives it has generally been assumed that the running gear being practically alike in each case should cost about the same for repairs, but there are conditions in the operation of the electric motor which should be favorable to the light wear of the running gear connected with it. This is especially true with regard to tire wear, which is so irregular on steam locomotives, not only on individual tires but with those on different wheels, and where connecting rods are used all tires must be turned to the diameter of the one most worn. If the sliding of drivers is avoided on the electric locomotive, the tire wear should be much more uniform and less in amount than on steam locomotives, and as there are usually no parallel rods on electric locomotives, it should not be necessary to turn the tires for different trucks to uniform diameter. On account of the uniform rotation of the electric motor, the wear of driving axles should also be less as the effect of the constant knocking in the driving boxes due to the change in direction of pressure with every stroke of the piston is avoided by the uniform pressure due to the constant rotation of the armature.

Probably the most complex feature connected with the comparative cost of repairs of steam and electric locomotives is due to the fact that the electric locomotive is not connected to the firebox and boiler in one unit as in the locomotive. It is true that in obtaining the total cost of maintenance the power plant must be included and here provision must be made for three to four times as much heating surface as is used in the locomotive and that must be reckoned with in obtaining the real cost of maintenance of motive power. In the power plant, advantage can be taken of water purifiers and the cost of maintaining boilers be kept down to a very low figure. The total life of the boilers will also be much longer than that of the locomotive on account of the much lower rate of combustion employed. In repairing the firebox and boiler of locomotives most of the machinery is taken down, and often repaired when but slightly worn and this is a disadvantage adherent to the locomotive in the matter of repairs and one in which the electric locomotive must have material advantage. These are some of the reasons why it may be expected that where a comparison is made between the cost of maintenance of steam and electric locomotives in similar service it will be found that for electric locomotives the cost will be much less than for equivalent power in the steam locomotive.

It is also reasonable to think that the numerous improvements which are being made in the electric locomotive in the matter of simplification and the advantages attending the use of the alternating-current motor must further reduce the cost of maintenance below any figures which have thus far been presented. While the actual figures showing the cost of maintaining electric locomotives on the B. & O. road may appeal to railroad managers as having greater value than any estimates, yet we believe that for the reasons just given it is safe to predict that electric locomotives now building, whether for direct current or alternating current, will not cost for repairs and maintenance anything like the figures given in the paper earlier referred to.

DEPRECIATION.

There is no more positive and enduring demand than that for cheap and rapid transit in and between urban communities, and therefore the electric railways which today supply this need should by rights have the greatest stability and be managed in a way that will insure them permanence, especially when considered from a financial standpoint. It is notorious that in many instances electric railways fall short of being the ideal investments that they should be, and we believe that the reason is largely in the fact that too little attention has been paid to the future demands which will have to be met. The provisions for the future which a railway should make are of several kinds, and the term suggests reserve funds, sinking funds and depreciation or their equivalents.

Some kinds of future demands, certain or contingent either as to existence or amount, are recognized by all as belonging to operating expenses, and therefore should be apportioned over the entire year instead of being all charged against the particular months in which they have to be met. Accordingly, it is the general practice to create on the books certain reserve funds to meet accident and damage claims when settled (either before or after litigation), for the payment of insurance premiums or meeting fire losses, for taking care of extraordinary but indefinite contingent liabilities, etc. These funds may be created by charging to operating expenses monthly, one-twelfth of the total that is estimated to be necessary, or by charging each month such proportion of the gross receipts as experience indicates will be ample for the purpose. Taxes, which in the opinion of street railway accountants are an operating expense, but which, out of deference to the steam railroad practice, are entered as a deduction from income, are cared for in a similar manner, except that the proper proportion appears as a deduction from income in the monthly report instead of as a charge to operation. In the matter of reserve funds of this kind there is substantial agreement as to principle, and only those variations occur in practice which experience with local conditions dictates.

When it comes to sinking funds and depreciation, however, while the accountants are agreed that sound accounting requires provision to be made for paying bonds when they become due, and for replacing physical property worn out in service, the managers and directors of American street railway properties, with a few notable exceptions, have failed signally to heed this expert advice. Proper distinction as to motive should be made between the neglect which is so common and the downright rascality which is found occasionally; unfortunately, the result to the security holder is the same.

Twenty-five years ago it was much more common than it is now to stipulate in mortgages for sinking funds wherewith the bonds secured could be paid at maturity. That the sinking fund has gone out of vogue is perhaps because of the belief that a going concern always can rely upon renewing its reasonable loans. Such is undoubtedly the case when the matter is not complicated by the fact that the business may be limited as to time of operation. Thus, a railroad chartered for 50 years and with the right to re-incorporate at the end of each 50 years without being subjected to new burdens, and owning all its property in fee or having an absolute right of way so long as the road is operated, may with some reason issue 100-year bonds and rely upon floating a new issue when the time comes to redeem the old ones. But for a street railway having a short-time franchise, say, for 25 or 35 years, to issue bonds and make no proper provision for their repayment by the time the franchise will expire, betrays poor judgment on the part of the management, or great confidence in the credulity of investors, a confidence which we regret to say is too often justified.

Provision for the amortization of capital need not necessarily be made by means of a sinking fund, but such a fund invested in interest-bearing securities (some of the bonds to be redeemed, perhaps), is by all means the safest and surest method. If there be established an adequate depreciation reserve—the word adequate should be emphasized—it in theory would afford all the security of a sinking fund. The Glasgow Tramways has a sinking fund as well as depreciation reserves, but its policy is open to the objection that the sinking fund is invested in the property as extensions or betterments.

An electric railway in New York or Pennsylvania, for instance, chartered for 999 years or longer, and with city franchises running for the life of the charter, is in a better position as to providing for the retirement of its funded debt when due. But having in mind the rapidity with which demands for new capital grow, it would be the part of wisdom for even the most favorably situated corporation to arrange for the liquidation of its bonds without incurring a new debt. The bond underwriters having it in their power to dictate the terms of the mortgage, owe a duty to investors to see that ample sinking funds are required.

It is a law of nature that matter deteriorates with use, and since depreciation exists, it is the duty of the management to face the fact and make such charges to operation as will maintain unimpaired the value of the physical property. The attitude of American street railways in general for years was that described by saying: Posterity will take care of depreciation. The recklessness of this policy is demonstrated wherever events march a little too rapidly, and present owners find themselves in the position so thoughtfully reserved for posterity, as is the case with the holders of Chicago street railway securities.

More recently this position is being recognized as untenable, and although usually nothing has been done towards providing for depreciation, managers will say that it is to be kept in mind, with the promise to do something when the earnings reach an amount which will permit of it being done. This has only good intentions to recommend it, because depreciation is as certain as taxes or interest, and just as much incident to operation as is the payroll. Insufficient surplus is no excuse for failure to make a charge for depreciation; in such case a deficit actually exists and it should be shown on the books.

Failure to face the depreciation question has resulted in deceiving investors, who learn too late that their capital has been dissipated in the dividends received from year to year (each a trifle more than was earned); and in deceiving the public, who think that such large dividends justify a demand for lower fares, for a franchise tax, or for some other equivalent to the public, such as free street lighting, paving, etc.

Some companies have taken the position that if maintenance and renewals are charged to operating expenses, all that is necessary has been done for depreciation. That this is erroneous will be seen by considering the road a short time before extensive renewals are necessary; a large proportion of the depreciation has then occurred and is a liability, without any asset to meet it, and the construction and equipment are carried as assets at a fictitious value.

What constitutes a proper amount to charge annually for depreciation is debatable. The proportion of cost that should be written off annually varies not only with the class of property, but with the local conditions under which it is used. There are exhibited in the following table some schedules followed in practice or recommended by authorities. Referring to the numbered columns,

No. 1 is the schedule followed by the British Columbia Electric Railway Company, Vancouver and Victoria, B. C. (Street Railway Review, July 15, 1904, page 461.)

No. 2 is the schedule of the Glasgow Tramways. Besides this depreciation the company also reserves annually 2 per cent of the funded debt to form a sinking fund.

No. 3 is the schedule now in use by the Kansas City Western Railway, operating between Kansas City and Leavenworth and in Leavenworth.

No. 4 is that recommended by Mr. D. McCall in his "Tramway Book-keeping and Accounts."

No. 5 shows figures compiled by Mr. Philip Dawson; the general average of a minimum of 8 to 10 per cent for depreciation was deduced by Mr. H. S. Knowlton from Mr. Dawson's figures, and 10 per cent is recommended by Mr. C. L. S. Tingley as closely approximating the facts. (Street Railway Review, November 15, 1905, page 793.)

Class of Property	—Annual Depreciation, Per Cent—				
	1	2	3	4	5
Electrical machinery	5	5	7.5	5	....
Generating units, direct connected	...	....	....	....	4 to 8
Rotary converters	...	....	....	....	8 to 10
Transformers	...	....	....	....	5 to 6
Storage batteries	...	....	....	....	9 to 11
Motors	...	....	....	7.5	5 to 8
Steam and water machinery	5	5	7.5	5	....
Turbines	...	....	....	....	7 to 9
Engines, slow speed	...	....	....	....	4 to 6
Boilers	...	....	....	....	8 to 10
Rolling stock	3.5	7.5	7.5	7.5	4 to 6
Miscell. car equipment	...	5.81	....	....	....
Overhead system	...	....	....	....	3 to 8
Poles	10	....	5	3	....
Lines	3	3.09	....	....	....
Feeder cables	...	....	....	3	....
Ducts and manholes	...	....	....	2.5	....
Section boxes	...	....	....	4 to 5	....
Shop equipment	...	7.5	....	7.5	12 to 15
Track	2	$2,182.50	....	$2,191.50	....
	...	per mile	....	per mile	7 to 13
Rails	...	....	55 cents	....	....
	...	....	per ton	....	....
Ties	...	....	12.5	....	....
Track bonding	...	....	....	7.5	6 to 10
Paving	...	....	10	....	....
Buildings	1	2.5	2.5	2.5	1 to 2
Office furniture and Fixtures	5	7.50	....	2.5	....
General average (Knowlton)	...	....	....	....	8 to 10

Some of the leading American companies have taken the first steps toward meeting the condition. Thus, the Milwaukee Electric Railway & Light Company has for years credited to a depreciation reserve fund 10 per cent of the gross earnings, and the United Railway of St. Louis in 1905 adopted the policy of crediting 5 per cent of the gross earnings to depreciation reserve; with both of these companies these funds are invested in bonds of the company or of underlying companies. The Washington (D. C.) Railway & Electric Company, the Montreal Street Railway and the Rochester Railway are among others which show depreciation reserves in their balance sheets. Since 1898 the Philadelphia Rapid Transit Company has made large appropriations out of earnings for roadway and track and for power plant renewals; in 1905 these were 7 per cent of gross earnings for roadway and track and 6 per cent of gross earnings for power account.

Whether the depreciation in these instances is sufficient depends on the franchise term and upon the extent to which the good will of the underlying companies was capitalized when they were consolidated and the properties taken over by the present owners. The question is how much of the plant and property account is represented by tangible property on which depreciation must be charged, and how long a time remains in which the company can provide for the amortization of that portion of capital stock and funded debt which in fact represents good will or franchise values. Specific reports analyzed and compared with these standards will show startling results.

It is extremely gratifying to know that the question of "Depreciation" is to be discussed by the American Street and Interurban Railway Accountants' Association at its next meeting in Columbus. The necessity for a consideration of depreciation by electric railway companies was clearly stated in the address of Mr. H. J. Davies, then president of the association, at the Saratoga convention in 1903, and the sound principles there laid down undoubtedly are recognized by railway accountants. The diverse figures that we have quoted as to what the rate of depreciation is or should be indicate the need for a discussion as to details and the formulation of a schedule. It is hoped that this work will be taken up and carried out by the Accountants' association, and that the matter will then receive, at the hands of the parent association, the attention that it deserves.

"THE CHICAGO-NEW YORK ELECTRIC AIR LINE RAILROAD."

For some weeks the daily papers of Chicago have been printing full-page announcements headed in large type: "Chicago to New York in 10 Hours—Fare $10—New Direct Electric Road Startles the Transportation World—Route 160 Miles Shorter than the Shortest—Time 10 Hours Quicker than the Quickest—Fare $10 Cheaper than the Cheapest." Then follow seven long newspaper columns in fine type crowded with extravagant assertions in regard to the character of the country which is supposed to be crossed without a curve, and with scarcely any variation from level grade, the low cost of operation, the immense receipts from traffic, the enormous dividends which are sure to be paid, and the prodigious profits which those who now buy the stock of this intangible enterprise are absolutely certain to realize.

The stock-booming prospectus starts with the statement that the "long-dreamed-of project of a direct, trunk-line electric railroad between Chicago and New York has at last become a reality in the form of the Chicago-New York Electric Air Line Railroad." So far as the Electric Railway Review has been able to learn the only reality in this project thus far is the incorporation, in the distant state of Maine, on November 1, 1905, of the "Chicago-New York Electric Air Line Railroad Company," capital stock $2,000,000; president, M. W. Baldwin, Portland, Me., and four other directors of the same city. The advertisements at first named Alexander G. Miller, of Aurora, Ill., as president, F. C. Raff as vice-president, H. E. Procunier as treasurer and T. M. Bates as secretary, these, with two other Chicago men, constituting the alleged board of directors. Following severe criticisms of the extravagant prospectus by various railway journals, several of these names were dropped in the next advertisement, as was also that of the agent for the sale of the stock—the latter subsequently writing to the Railway Age, disclaiming all connection with the project and repudiating "the statement of earnings and the stock certificate plan for the exchange of railroad transportation" which forms a large feature of the prospectus. So far as we can learn, no survey has ever been made for the "Chicago-New York Electric Air Line," or any other railroad upon which can be based the assertions of an air-line, almost level route, only 750 miles long, between the cities named; no charter appears to have been obtained in any state through which the assumed road is to run; no ties, rails, cars, locomotives or supplies of any kind are known to have been contracted for; not a shovelful of dirt has been turned; no right of way for the road that is to drive straight through farms, forests, houses, factories, cities, seems to have been made the subject of appraisement even, much less of purchase, and the undertaking of building a world-astonishing railway which is to cost the prodigious sum of "one hundred and fifty million dollars" seems to have progressed no farther than the opening of an office in Chicago for the receipt of money for stock certificates in this mysterious corporation at the sacrificial price of $25 per $100 shares, on the easy installment plan.

Some idea of the extravagant, not to say deceptive nature of the inducements which are held out to "the plain people" to drop their money in this project may be gained from the following summary which one of the railway papers assumes to be deducible from the scattered assertions and promises in the advertisement:

C.-N. Y. E. A. L. Railroad.

Length of line proposed, miles	750
Cost of road, estimated	$150,000,000.00
Cost of road per mile	200,000.00
Capital stock required, at $25 per $100 shares	600,000,000.00
Yearly earnings from passenger traffic	32,000,000.00
Earnings per mile of road	42,666.66 2-3
Operating expenses, 50 per cent of gross earnings	16,000.000.00
Operating expenses, per mile	21,333.33 1-3
Net earnings	16,000,000.00
Net earnings, per mile	21,333.33 1-3
Annual dividends on $600,000,000 at 30 per cent	180,000.000.00
*Apparent deficiency in net earnings to meet guaranteed dividends	164,000,000.00
"Population dominated" by this road	9,600,000
"Population dominated" per mile of road	12,800
"Population dominated" per foot of road	2.4
Passenger rate per mile—750 miles at $10	1.333c
Rate to stockholders—25 per cent of above, at $2.50—per mile	0.333c
†Number of passengers to be carried yearly at $10 to earn $32,000,000	3,200,000
Number of passengers to be carried per day at $10 to earn $32,000,000	8,767.11

*Of course this is a mere matter of bookkeeping, to be equalized by increasing the net earnings or selling more stock.

†To this should be added, say 100 per cent for the number of passengers likely to travel on their stock certificates without paying anything, making the total number of passengers 6,200,000 yearly, or 17,534.22 per day, not counting several million local passengers.

Although 30 per cent dividends and a competence for life on the investment of a few hundred dollars would seem sufficiently tempting, the promoters have added the novel inducement of exchanging transportation for stock certificates at their face value—$100 for $25—which no doubt will bring money into the treasury at a rapid rate as long as people are willing to take wild promises for performance and ask no security. But when they begin to inquire what has been done with their money the trouble may begin.

The financing scheme of the "Chicago-New York Electric Air Line Railroad" seems to us vicious, dangerous and wholly unworthy of confidence by investors.

THE TRAFFIC CAPACITY OF SUBWAYS AND TUNNELS.

There is no more important question in connection with the design, construction and operation of a subway or tunnel than the maximum volume of traffic which can be handled therein with safety and comfort. The enormous cost of underground lines of rapid transit justifies and in fact demands, the most painstaking and constant study of actual operating conditions, and it is safe to say that there is always something new to be learned in regard to the best methods of handling large crowds of people in such structures and upon their approaches.

In many quarters there is a mistaken impression that rapid transit is always afforded by a subway accommodating surface cars entering it from the streets, whereas such a system often does little more than improve station facilities and mitigate congestion on the streets overhead. As long as the interval between cars is greater than the minimum possible intervals on the connecting surface lines, a measure of rapid transit is afforded by a subway throughout its length on account of the elimination of many otherwise necessary stops and slow-downs; but in general the service is limited in capacity by the capacity of the approaches, in size of cars by the size of cars that can be safely run over the approaches, and in regularity by the natural street obstructions which unavoidably make all surface car service irregular. The station platforms in a subway for surface cars must be larger than are required for a train service because passengers wait a greater percentage of the time for cars for a particular point instead of being removed by each train as it arrives.

The principal superiority of a tunnel or subway for trains over an underground route for surface cars lies in the opportunity for trains to make high speeds outside the tunnel over a right of way unrestricted by other traffic. In Boston, for example, the elevated trains running between given points take less than one-half the time of surface cars running underneath them between the same points. Outside the subway the trains are impeded by nothing but their own signals at the entrance of each block section of track and not by these unless traffic has been delayed by causes entirely foreign to street blockades and disturbances.

A subway or tunnel for train service can also handle almost three times as many people per hour, figuring on seated passengers alone, as an underground surface car line. Under Boston conditions, 240 surface cars, each seating 34 passengers, supply 8,160 seats per hour; while 60 elevated-tunnel trains of 8 cars each supply 23,040 seats per hour. In Boston it is difficult to cut the surface car interval on any single line to less than 15 seconds, whereas the new Washington street tunnel in that city is designed for eight-car elevated trains, and there is no question but that a train every 60 seconds is entirely possible in a suitably constructed tunnel. In New York six-car trains are operated at less than one-minute intervals and in Chicago trains running through interlocking junctions at intervals of about 45 seconds have been found to be practicable.

The maximum passenger-carrying capacity of an elevated car is a rather flexible figure, but with eight-car trains in service in the north and sound-bound tracks of the Washington street tunnel, described in this issue, on one-minute headway, allowing 150 passengers per car, the tunnel should be capable of removing at least 144,000 people per hour from the center of the city, and if worked to the utmost limit it is probable that nearly 200,000 passengers per hour could be handled in the tunnel, provided that one-minute intervals could be maintained under the conditions of platform and car aisle congestion which would undoubtedly ensue.

The relative traffic capacity of a tunnel for train service as compared with a subway for trains—defining the tunnel as a subway of rather greater depth below the surface—probably favors the former. An underground line located at considerable depths below the ground is as a rule straighter in point of curvature and of a more favorable profile than a subway which follows the variations of the street above it in alignment and grade.

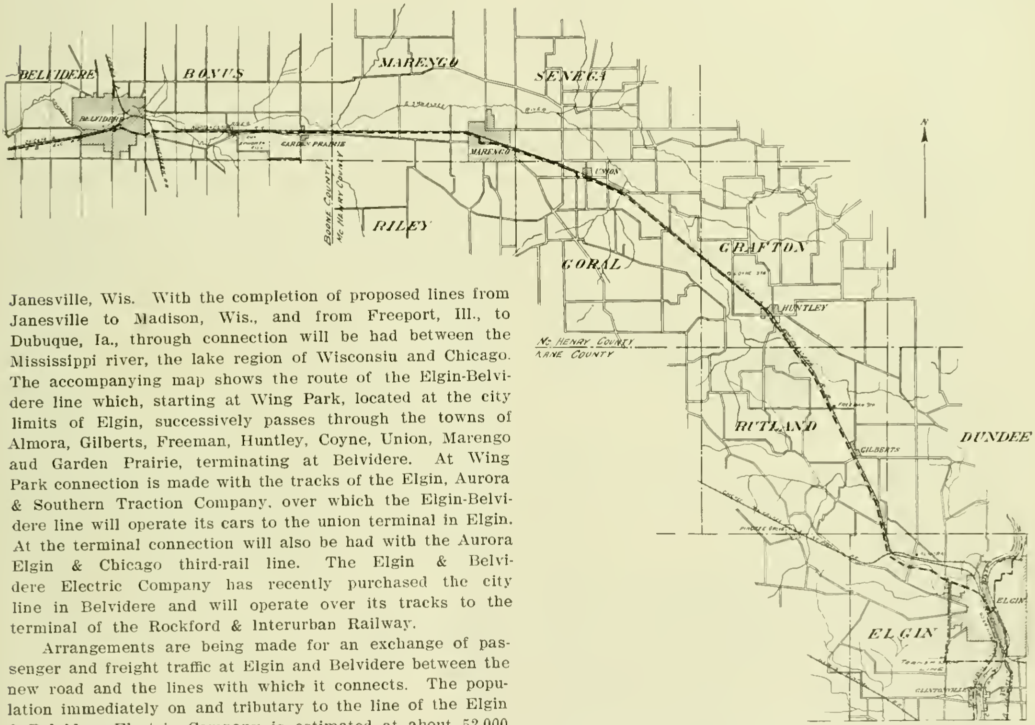
Within a tunnel or subway there are a number of ways in which the traffic capacity may be pushed close to the maximum. Short block sections, electrically-lighted train annunciators at platforms, ample platform areas, provision for the partial separation of incoming and outgoing passenger streams, advance signals of train movements, alert platform men, first-class telephone service in sound-proof booths, and plenty of ticket-selling windows in rush hours, coupled with specific signs to aid strangers in using the trains, all count for quite as much as a rolling stock motive power of 15 or 20 horsepower per ton, an acceleration of 1.5 or 2 miles per hour per second, air brakes with graduated release, and similar valuable means of forcing the cars over the line at high speed.

It is most interesting to note how all these different features are dovetailed together in the best operated systems, and to realize how little after all the power cost of performing a schedule underground in a large city determines what that schedule shall be. Subways and tunnels are the most costly tools of urban rapid transit, and their full capacity can be realized only under conditions of intensified transportation output.

THE CONSTRUCTION WORK OF THE ELGIN-BELVIDERE ELECTRIC RAILWAY.

The Elgin & Belvidere Electric Company is an Illinois corporation which is constructing an electric railway from Elgin to Belvidere, Ill., a distance of about 36.5 miles. The construction work on this road is of a high order and is now rapidly nearing completion. It is expected that the line will be in operation some time in September of this year. A number of interesting features are included in the work and a description covering the more important points will be presented.

The railway will serve a number of cities and towns located in one of the most prosperous sections of the state about 40 miles northwest of Chicago and will form the connecting link of an electric railway system between Chicago, Elgin, Belvidere, Rockford and Freeport, Ill., and Beloit and Janesville, Wis. With the completion of proposed lines from Janesville to Madison, Wis., and from Freeport, Ill., to Dubuque, Ia., through connection will be had between the Mississippi river, the lake region of Wisconsin and Chicago. The accompanying map shows the route of the Elgin-Belvidere line which, starting at Wing Park, located at the city limits of Elgin, successively passes through the towns of Almora, Gilberts, Freeman, Huntley, Coyne, Union, Marengo and Garden Prairie, terminating at Belvidere. At Wing Park connection is made with the tracks of the Elgin, Aurora & Southern Traction Company, over which the Elgin-Belvidere line will operate its cars to the union terminal in Elgin. At the terminal connection will also be had with the Aurora Elgin & Chicago third-rail line. The Elgin & Belvidere Electric Company has recently purchased the city line in Belvidere and will operate over its tracks to the terminal of the Rockford & Interurban Railway.



Elgin-Belvidere Construction—Map Showing Route of the Elgin-Belvidere Electric Railway.

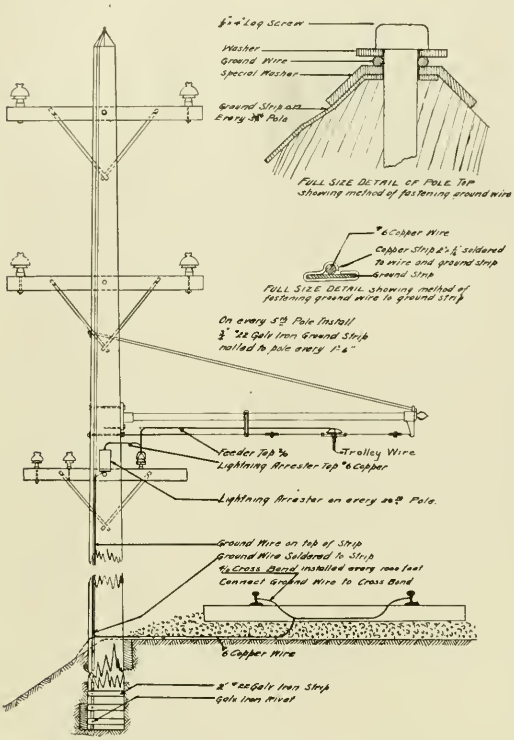
Arrangements are being made for an exchange of passenger and freight traffic at Elgin and Belvidere between the new road and the lines with which it connects. The population immediately on and tributary to the line of the Elgin & Belvidere Electric Company is estimated at about 52,000 which, with the additional population of at least 250,000 made accessible by the connecting lines previously mentioned, will provide the company with a passenger traffic basis of over 300,000 population. A good freight business is also expected and stub-end sidings will be built at crossroads at convenient distances apart. The most important dairy interests of Illinois lie to the west of Elgin. The plant of the Borden Condensed Milk Company is located close to the right of way at Marengo and a heavy daily shipment of milk is expected. With the exception of short stretches through the several towns the electric road closely parallels the steam line of the Chicago & Northwestern Railroad and occupies an adjacent right of way for the greater part of the distance.

Track Construction.

Except in the cities and towns the line is built entirely upon private right of way 50 feet wide. The country traversed is comparatively level and for the most part the grading has been light. There are several long tangents, one extending west of Gilberts for a distance of over 9 miles, which will aid in maintaining a fast schedule. A maximum grade of two per cent has been maintained and curves of long radius are used outside of the towns. The track has been placed far enough to one side of the center of the right of way to allow the construction of a second track.

A rather serious engineering difficulty was encountered at a point on the line about a quarter of a mile west of Gilberts. The soil at this point consists of a crust of peat about 7 feet thick covering a marsh some 40 feet deep. The roadway over the marsh is in fill and it was found after a considerable quantity of earth had been placed that the crust sank under the weight and forced up the earth at the sides of the embankment a distance of several feet. The pressure was so great as to cause the telegraph poles and fence posts on the Chicago & Northwestern right of way to be raised some little distance from their normal position. A considerable quantity of earth has been deposited in this sink hole and it is now believed that a firm foundation has been secured.

The track is laid with 70-pound T-rail in 33-foot lengths, the use of the long rail affording a saving in the number of joints. The rails rest on 6x8-inchx8-foot ties, the greater portion of which are of cedar, although some cypress and tamarack ties are used. The ties are spaced 17 to the rail. The joints are of the Weber type 22 inches long with four bolts and the rails are bonded with the Ohio Brass Company's soldered "spectacle" type of bond. At intervals of 1,000 feet cross-bonds of No. 0000 copper wire are installed. The track is ballasted to a depth of 6 inches under the ties with gravel obtained from three gravel pits located at short distances from the right of way. For the present there will be five through turnouts and seven stub switches. All special work is of the built-up type of construction made with 70-pound T-rail. The right of way is enclosed by woven wire fencing with one strand of barbed wire at the top. The cattle guards are of treated oak of the slat type.


Lag Screw
Washer
Ground Wire
Special Washer
Ground Strip on Every 5th Pole
FULL SIZE DETAIL OF POLE TOP showing method of fastening ground wire
#6 Copper Wire
Copper Strip soldered to wire and ground strip
Ground Strip
FULL SIZE DETAIL showing method of fastening ground wire to ground strip
On every 5th Pole Install ¾" #22 Galv Iron Ground Strip nailed to pole every 1'-6"
Feeder Tap
Trolley Wire
Lightning Arrester Tap #6 Copper
Lightning Arrester on every 20th Pole.
Ground Wire on top of Strip
Ground Wire Soldered to Strip
Cross Bond installed every 1000 feet
Connect Ground Wire to Cross Bond
6 Copper Wire
2" #22 Galv Iron Strip
Galv Iron Rivet

Elgin-Belvidere Construction—Arrangement of Transmission, Feeder and Trolley Wires.

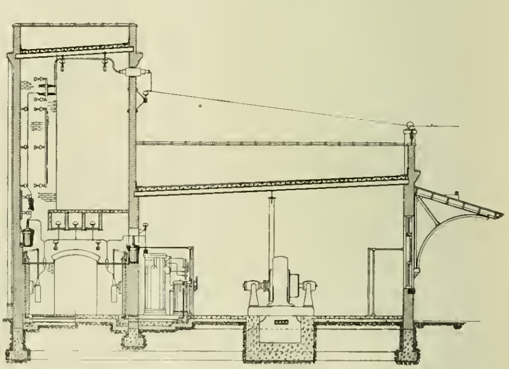
Transmission Line and Overhead Construction.

Current for the operation of the line will be obtained from the power house of the Aurora Elgin & Chicago Railway at Batavia. This well-designed power plant was described in The Street Railway Review for June, 1905. The current will be taken from that company's Clintonville substation and transmitted through a high-tension line across the country to Elgin. The three-phase alternating current at a pressure of 26,400 volts will be stepped down and transformed to direct current at an operating pressure of 600 volts at three substations located at Gilberts, Union and Garden Prairie.

Except through towns and at other points where cross suspension is necessary the overhead construction is of the bracket type, and the high-tension, feeder, telephone and trolley wires are all carried on the same pole. The poles are of cypress 40 feet in height with 7-inch tops. Cypress was selected in preference to cedar as the general run of cypress timber was found to be sounder than cedar and therefore a longer pole life was thought to be insured. The poles are spaced 100 feet apart and are set 7 feet in the ground. In soft ground the poles are anchored by an A-frame consisting of two 2x10-inchx8-foot timbers fastened to the pole with 4-inch lag screws and supported at the other end by six 2x4-inch stakes driven in the ground. The A-frame is attached to the pole at a point 2 inches below subgrade. The method of anchoring just described is shown in an accompanying illustration. Through the towns and over railroad crossings, the high-tension line is carried on a separate pole line of 60-foot cypress poles with 8-inch tops.

The accompanying illustration of a typical 40-foot pole shows the arrangement of the trolley, feeder, telephone and high-tension lines and also the arrangement of the ground wire, lightning arrester and feeder tap. The high-tension cables are equal in conductivity to No. 6 hard-drawn copper. They are attached to Locke No. 408-A insulators of glazed porcelain which are carried on cross-arms of thoroughly seasoned pine. The cross-arms are spaced 5 feet 2 inches apart on the pole and this distance is maintained in the spacing of the insulators on the cross-arms. Provision has been made for the future installation of a fourth high-tension wire. Should one of the wires become disabled the spare wire may be placed in service by means of jumpers in the substations. The low-tension feeder cable is of 300,000 circular mils section and is carried on Locke No. 47 insulators. The telephone line is of hard-drawn copper wire of No. 12 B. & S. gauge carried on Locke No. 12 insulators. The cross-arm carrying the telephone and feeder wires is placed 6 feet below the lower high-tension cross-arm. Transposition of the telephone wires is effected at every fifth pole. The wires are transposed between two insulators on the same pole instead of between two poles, which is the usual method. By this arrangement there is less danger of a contact between the wires, due to a slackening in the line. The trolley is of No. 000 grooved copper wire suspended in the usual manner from 9-foot tubular steel brackets 1½ inches in diameter.

The greatest care has been taken in providing protection against lightning. On every fifth pole there is installed a ¾-inch ground strip of No. 22 galvanized iron. The ground strip is fastened to the ground wire at the top of the pole by means of a lag screw and washers in the manner shown in the illustration. The ground strip extends down the pole and is connected at the base with three 2-inch bands of No. 22 galvanized iron. A lightning arrester is installed on every twentieth pole, the ground wire for the arrester being of No. 6 B. & S. guage. By the use of the galvanized iron ground strip the number of lightning arresters required has been reduced one-half. The company furnishing the arresters has guaranteed that when installed in connection with the strip, 50 per cent of the number that would otherwise be required will afford complete protection. The method of fastening the ground wire for the lightning arrester to the galvanized iron strip is also clearly shown in the illustration.



Elgin-Belvidere Construction—Vertical Section Through Typical Substation.

Bridges.

One of the most interesting features in the construction of this road is the ribbed concrete-steel bridge over the

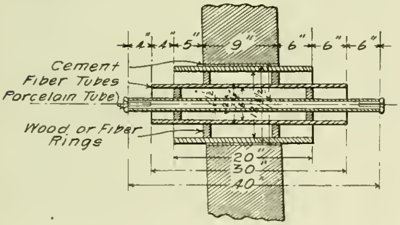
Kishwaukee river near Belvidere. This bridge was constructed by the Strauss Bascule & Concrete Bridge Company of Chicago, of which Mr. J. B. Strauss is president. Mr. K. Hojgaard was the engineer in charge of construction. The company has devised a novel method of erecting reinforced concrete arches which does away with the usual false work and wooden centering and this bridge is the first one built by this method. The form of ribbed arch used, the method of erection and the several appliances employed in connection therewith, were invented by Mr. Strauss and are covered by patents owned by the Strauss Bascule & Concrete Bridge Company.

The bridge is a single-track structure comprising four 87½-foot arches with a solid-ballasted floor throughout. There are two ribs, each 24 inches thick, 2 feet 8 inches deep at the crown and 4 feet 2½ inches deep at the haunches exclusive of the concrete-steel forms. With the forms the thickness is 30 inches and the depth 3 feet and 4 feet 6½ inches respectively. The ribs are connected by eight diaphragms for each span, each 21 inches thick. On top of the diaphragms are placed cross-walls 12 inches thick which, together with the spandrel walls which are 12 inches thick, carry the floor slabs. The floor slabs are 6 inches thick and a curb is provided which forms a bed for the ballast. The piers are of the usual type of construction and the abutments are ribbed to correspond with the arches.

The erection was carried on by means of a system of sectional concrete-steel forms as shown in the illustration. These forms are trough shaped and open at the ends and top. The sections are about 5 feet in length, the sides are 3 inches thick and the bottom 4 inches thick. The sides and bottom are reinforced with steel and a satisfactory bond is secured by means of steel rods extending from the forms into the core. Each arch rib is made up of 17 of these forms.

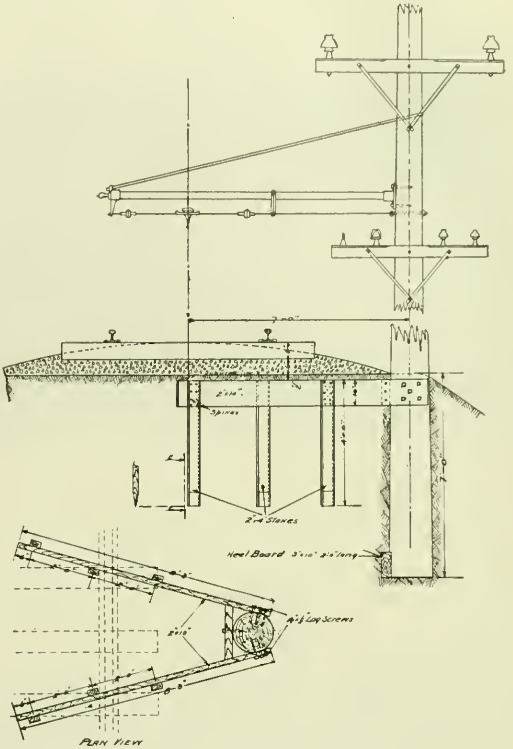
In placing the forms in the arch two gin poles were erected, one at each end of the span and anchored back to the nearest pier or to a point on the bank. The sectional forms were then swung in place by a traveler and the two ribs erected simultaneously, starting from each haunch and working toward the center. Each section was supported on the adjacent section and by a guy line back to the gin pole. These guy lines were each provided with an adjusting mechanism so that any one section or all could be raised or lowered as required. With the placing of the keystone the skeleton arch thus formed became self-sustaining. The pleted in the usual manner by using wooden forms for the the adjacent arches.

When the entire bridge had thus been built in skeleton outline the steel reinforcements and concrete core were placed in position. As the concrete was applied the arch adjusted itself gradually to its final form, the joints between the sections were closed up and properly pointed and the concrete was left to set. The superstructure was next completed in the usual manner by using wooden forms for the spandrel and cross-walls and floor slab.



Elgin-Belvidere Construction—High-Tension Wall Insulator in Substation.

In order to observe the settlement of the arch ribs caused by the dead weight of the structure elevations were taken at the crown of each arch rib before and after placing the concrete and before the concrete had hardened in the arch ribs and diaphragms. It is interesting to note that the average settlement proved to be less than .5 inches and that after the walls and floor were concreted the uniform settlement was but .34 inches, which corresponded in effect to a live load of 3,200 pounds per lineal foot. It was also observed that the settlement occurred immediately after the concrete was placed and before it had set. No settlement was observed at the piers and abutments.



Elgin-Belvidere Construction—Method of Anchoring Trolley Poles in Soft Ground.

Although the method of erecting the arch ribs was employed here for the first time, the entire superstructure of the bridge, including walls and floor, was completed in the course of 30 days, notwithstanding the fact that there was serious delay in getting sufficient labor. It is not probable that this result could have been obtained with the ordinary method of building arches by means of wooden centering.

The bridge was designed for a live load of 1,800 pounds per lineal foot and will carry a train of two 40-ton cars with a factor of safety of five. The track over this bridge is ballasted with 6 inches of crushed rock.

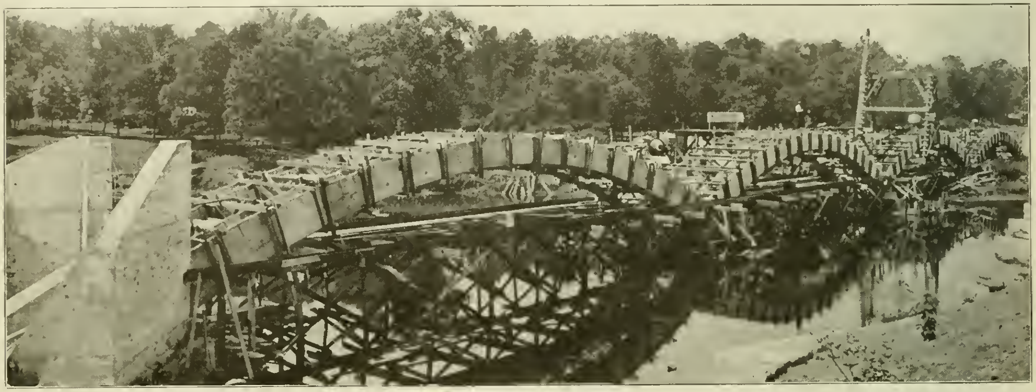
The other bridge work along the line is of standard trestle construction. At a point near Almora there is an under-crossing with the Chicago Milwaukee & St. Paul Railroad. This is a concrete culvert with an opening 43 feet in length, 14 feet wide and 20 feet high, with wing walls at either end. The trolley, telephone and low-tension feeder lines are carried through the culvert. The trolley is carried on mine hangers set in wooden troughs. The low-tension and telephone lines are carried on brackets set into the side walls. The high-tension line and ground wire are carried above the steam tracks and telegraph wires on poles set in sockets in the concrete of the culvert.

Substations.

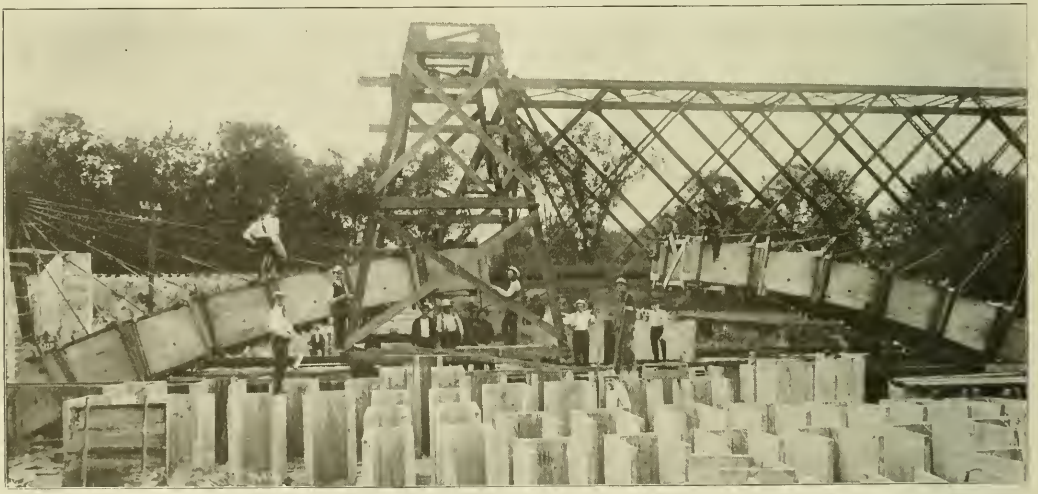
There are three substations located respectively at Gilberts, Union and Garden Prairie, approximately 10 miles apart. The three buildings are practically alike in construction and equipment except that the substation at Gilberts has been built on to an old brick building purchased with the lot and which is to be used for passenger, express and storage purposes. The main portion of each substation is 32x31 feet in floor area and 25 feet high and there is a tower at the rear 27x12 feet in floor area which extends 7 feet above the main portion of the building. The walls are of brick and rest on concrete foundations. The roofs are of cinder concrete and steel over which was placed a three-ply composition roof covering. The floors are of concrete and in the buildings at Union and Garden Prairie spaces will be partitioned off with iron railings to serve as waiting rooms.

The equipment of each substation is of General Electric manufacture and consists of a 300-kilowatt, 600-volt, 25-cycle, three-phase rotary converter, three 110-kilowatt, 25-cycle, 26,400-370-volt transformers, oil-cooled reactance coils, oil switches, switchboards, and the other necessary apparatus. In each station provision is made for the installation of an additional rotary at some future time.

Instead of employing the usual type of strain tower the high-tension wires enter the substation from two 45-foot poles located opposite the front of the building. The poles are securely guyed to each other and to the ground. Insulation is provided between the poles by means of a Brooklyn strain insulator. The wires are carried on Locke No. 606 high-tension strain insulators and the poles are set with their cross-arms at an angle of 45 degrees to the line. From the strain poles the wires pass to a rack on the parapet at the front of the building and thence to another rack on the wall of the tower. The high-tension wires enter the building at the top of the tower through insulators composed of three fibre tubes of 1½, 6 and 12 inches inside diameters, set one inside the other and separated by maple rings boiled in compound. The wires are carried through porcelain tubes set inside the fibre insulators. The details and dimensions of this insulator are shown in an accompanying illustration. Inside the tower the wires are separated by brick partitions and pass through the disconnecting switches, lightning arrest-



Elgin-Belvidere Construction—Ribbed Concrete-Steel Bridge over the Kishwaukee River.



Elgin-Belvidere Construction—Method of Erecting Concrete-Steel Bridge over the Kishwaukee River.

ers and reactance coils in the manner shown in the accompanying sectional view of the substation. The busbars are contained in brick chambers which are closed at the side and top instead of at the bottom and side as usual.

Equipment.

For the initial equipment six single-ended interurban passenger cars of the Pullman type of construction have been ordered. The cars have an over-all length of 47 feet 1 inch, a width over the outside sheathing of 8 feet 6 inches and a height from the underside of sills to top of roof of 9 feet 4 inches. The car is divided into two compartments. The smoking and baggage compartment is located in the forward end and is fitted with rattan cross seats of the walkover pattern and longitudinal folding slat seats which may be lowered for the storage of baggage. There is a sliding door for baggage in this compartment; the only passenger entrance is through the vestibule at the rear. There is also an enclosed cab for the motorman which is fitted with a folding seat. The main compartment is fitted with the same type of seats used in the smoking compartment. There is a toilet room located in the forward end of the main compartment.

The interior finish of the car is of a dark mahogany with the exception of the smoking compartment which is finished in oak. The ceiling is of steel of the semi-empire pattern decorated in green and gold. A speaking tube connects the motorman's cab with the rear platform. All metal showing in the interior of the car has a bronze finish. The car is heated by a magazine coil heater located in the smoking compartment.

Each car is provided with four motors of 74 horsepower each. The straight-air brake equipment is used. These cars have been ordered from the St. Louis Car Company.

Two double-truck combined baggage and express cars have also been ordered. These cars are each 45 feet long and 8 feet 6 inches wide. Their construction is of the standard type.

Car House and Shops.

The company's cars house and shops are adjacent to the right of way and are located just outside the city limits of Marengo. The building is in course of construction and will shortly be completed. It is 105x91 feet in floor area and there is an addition at the front 51x20 feet in floor area. The building will care for the present equipment and it is expected to extend it at some later date, making it 330x155 feet in floor area. The main portion of the building is 25 feet high and the addition is 14 feet in height.

The walls are of brick resting upon concrete foundations. The roof and its supports are of frame construction and the roof is covered with a fire and waterproof compound. The building is lighted by four saw-tooth skylights arranged so as to get the benefit of the north light in winter. At night lighting is effected by a liberal arrangement of arc and incandescent lamps.

A brick wall extending the entire length of the building divides it into two portions, one of which is used for car storage and the other as a repair shop. There are three tracks entering the storage room, under one of which is a pit extending the entire length of the track. This pit is of standard concrete construction 54 inches deep. The floor of this portion of the building is of cinders.

The repair shop is 40 feet wide and is served by one track. An armature winding room, an office, employes' room and a store room are also contained in this portion of the building. These rooms are partitioned off with fireproof hollow-tile walls. By the use of the hollow tile the insurance rate has been much reduced.

The addition at the front of the repair shop is divided by brick partition walls into a boiler room, rooms for the storage of coal and sand and a paint room. The roof of this addition is of concrete-steel construction covered with a layer of the same material used on the roof of the main portion of the building.

Personnel.

The officers of the Elgin & Belvidere Electric Company are: Hamilton Browne, president, and R. G. Arnold, secretary-treasurer. Others interested in the project are Bion J. Arnold and W. L. Arnold. The Arnold Company, of Chicago, has charge of the engineering work, which is being supervised by George Weston, civil engineer; E. N. Lake, electrical engineer, and George A. Damon, managing engineer. The construction work is being done by the Main Construction Company, of which Arthur T. Browne is president and R. G. Arnold, secretary-treasurer. The offices of the Elgin & Belvidere Electric Company are at 181 La Salle street, Chicago.

LOW-PRESSURE STEAM TURBINES, PHILADELPHIA RAPID TRANSIT COMPANY.

The Philadelphia Rapid Transit Company in December, 1905, installed an 800-kilowatt Curtis low-pressure steam turbine at its power plant at Thirteenth and Mt. Vernon streets and early this year added a second similar unit. This station, which was briefly described in the "Review" for September 15, 1905, page 526, was a non-condensing plant with five 1,500-kilowatt generators direct connected to cross-compound engines.

The two new turbines are single-stage machines, with four wheels, each of which has a single row of buckets, and are designed to take steam at approximately atmospheric pressure. Each turbine is direct connected to a six-pole, 800-kilowatt General Electric direct-current generator.

The turbines exhaust into two Alberger surface condensers, with 8,000 square feet of surface each. The circulating water for the condensers is cooled by means of three Alberger cooling towers at the north end of the station. Each tower is 22 feet in diameter by 41 feet 6 inches high, and is fitted with two 9-foot fans, one on each side at the base running at about 300 revolutions per minute. The cooling towers are supported on a structure of reinforced concrete 50 feet high, with a platform at the top 78 feet long by 28 feet 9 inches wide. The original design provided for steel, but after the material had been delivered the strike against the American Bridge Company was declared. The Transit company would not tolerate the delay and substituted reinforced concrete for the steel. The illustration shows the tower structure before the diagonal bracing was put in place. This bracing consists of round rods with turnbuckles; the rods are attached to iron collars fastened to the posts at the junctions with the transverse members.

The motor-driven auxiliaries provided for the turbine installation comprise two 12-inch centrifugal pumps for circulating the condensing water through the cooling towers, one 5-inch Worthington centrifugal pump, which is used to supply the circulating water necessary to replace the loss through evaporation, and the cooling tower fan motors. The 12-inch circulating pumps are each driven by 120-horsepower motors, designed for speeds of 600 to 800 revolutions per minute, and the 5-inch pump is driven by a 20-horsepower motor; for each of the three towers there is a 40-horsepower motor to drive the fans. These auxiliary motors are all of the interpole variable speed type, made by the Electro Dynamic Company of Bayonne, N. J. Besides these electric auxiliaries there are two dry air pumps, one step bearing pump and two discharge pumps which are steam driven.

It is found that one turbine operated in connection with one engine can be made to deliver about 70 per cent of its capacity, but as to reach this figure practically all the steam is required, careful watching on the part of the engineer is necessary to prevent loss of vacuum because of ingress of air, and in practice with a single engine in operation the turbo-generator is regulated to give about 60 per cent of its rated output. When two engines are in operation one turbine is used and with three or more engine units running, both turbine units are in service.

The exhaust stack provided for the station when built is 72 inches in diameter by 150 feet high, and the back pressure of the engines, operating non-condensing, was approximately one pound. No relief valve is introduced in the exhaust piping, as when more than one engine is operated there is always an excess of steam which escapes through the exhaust stack. The back pressure on the engines, which was formerly about one pound, due to the existence of the exhaust stack, is now not above one-half pound. The steam supply for the turbines is taken through a connection with the main station exhaust. It is passed through oil separators and enters the turbines at somewhat less than atmospheric pressure.

By courtesy of the engineering department of the company we are enabled to give the following data concerning the method of operating the turbines and the results obtained:

Reinforced Concrete Support for Cooling Apparatus in Connection with Low-Pressure Steam Turbines.

The two turbines are operated at an average speed of 1,050 revolutions per minute. The generators are provided with auxiliary poles for commutation effect, the windings of these being shunted and in series with the armature, and the speed is controlled by field rheostats, a stronger field producing a lower speed, the voltage remaining the same. The generators carry a constant load with a given number of the turbine nozzles open. With four nozzles, the usual number open on each turbine, the load is from 1,100 to 1,300 amperes, and the generators are in parallel on the station busbar with the compound wound railway generators. Enough of the turbine nozzles, which are all hand controlled, are opened to give the desired load on the generator, and the speed is adjusted, as stated, by the field rheostat. If the turbine generator breaker should open while the unit is in service steam is automatically cut off from the turbine by a trip and butterfly valve.

Steam exhausts into the condensers at an average pressure of about 1 inch below the barometric pressure, thus giving an average vacuum of 28½ inches. The vacuum is maintained by dry air pumps and the condensed steam returned to the boilers as feedwater.

The power required for operating two centrifugal pumps and the three cooling tower fan motors is 350 amperes at 550 volts. When the 5-inch circulating pump, used to supply the amperes in cooling water, is in operation it requires about 15 amperes more. The current needed for these motor-driven auxiliaries is about 14 per cent of the output of the two turbines. The steam consumption of the two dry air pumps, one step bearing pump and two discharge pumps cannot be stated exactly.

The two turbines are operated about 18 hours a day and the only attention required is occasionally to rub the commutator and observe the speed and the condition of the oil supply for the top bearing. The auxiliary pumps require the usual attention.

The following table shows the output of the turbines in kilowatt hours, the total output of the station, the proportion of the turbine output to the total, and the coal, in pounds, per kilowatt-hour, by months, for the first half of 1906:

	Output in Kilowatt-Hours.		Turbine Output in	Lb. Coal
Month.	Turbines.	Total.	% of Total.	per Kw. H.
January	167,400	2,861,760	5.8	4.67
February	279,500	2,593,570	10.7	4.65
March	386,300	2,967,140	13.0	4.53
April	595,400	2,842,100	20.9	3.88
May	731,600	3,070,100	23.8	3.77
June	706,600	3,012,220	23.4	3.5

Note—The average coal consumption per kilowatt-hour for 12 months in 1905 when the turbines were not in operation was 4.48 pounds.

From this table there may be noted the effect of the turbine operation in reducing the coal consumption per kilowatt-hour. From the results shown here it is to be inferred that with additional turbines to utilize the exhaust from all of the five engines the consumption of coal would be reduced to 3 pounds per kilowatt-hour, which is equivalent to 2.24 pounds per horse-power hour.

The fuel used at this station is buckwheat anthracite, which contains about 20 per cent ash. Record is kept of the weight of all the coal delivered to the station, and the engineer has instructions to see that the bunkers are full at the end of each month, so that the total of coal delivered at this station represents the amount consumed during the month, and it is from these records that the coal per kilowatt-hour is computed. Referring to the table it will be observed that the coal consumption for June is considerably less than for May, although the proportion of turbine output to total output was practically the same for both months. This is due to the fact that the station bunkers could not be completely filled at the end of the month. It is probable that the average of the coal consumption for the months of April, May and June, which was 3.71 pounds, is a conservative figure for use in comparing the effect of turbine operation on the coal consumption.

Government Ownership of Street Railways

The government of the state of South Australia and the directors of the Adelaide Tramway Company have arrived at an agreement for the purchase by the government of all the tramways in the city of Adelaide for the sum of £280,000 ($1,362,620), says a recent consular report. The conditions are that, subject to parliamentary approval of the agreement and the shareholders' acceptance of the terms, the government guarantee to pass the agreement during the next session of parliament and also to introduce a bill for the municipalization of the system and the conversion of the lines to electric traction.

THE ONTARIO RAILWAY AND MUNICIPAL BOARD.

BY PROF. S. J. M'LEAN, UNIVERSITY OF TORONTO.

The general railway laws which have been passed by the various provinces of Canada follow, in the main, the general railway law of the Dominion. The province of Ontario is the first of the provinces to follow the example of the Dominion in providing for a railway commission. The legislation which effected this is to be found in two laws enacted in May of this year. The provisions of the legislation resemble in some respects the provisions of the Massachusetts legislation in that they have control over street railways. The Ontario railway act of 1906 is a codification of the hitherto existing Ontario legislation in regard to steam, electric and street railways. In the codification there are also included various provisions from private railway acts passed by the province; the regulative provisions of the Dominion legislation are, in the main, adopted; and there is also to be seen the influence of the legislation of Massachusetts and of New York. Especial attention is devoted to street railways. A street railway is defined as a railway whose tracks are almost wholly within the limits of a city or town, not being continued for more than a mile and a half outside the boundaries of such municipal organization. All other lines are placed under the common heading of railways. The legislation applies to every railway of every sort under provincial jurisdiction, not only to those at present in existence, but also to those later to be constructed. Provision is made for the ordering of stops at any place on any sort of railway. So far as street railways are concerned, this provision is attributable to a dispute over a matter of this kind which recently arose between the Toronto Street Railway and the city of Toronto. The giving up of any stopping-place, or the closing of any station is subject to the consent of the railway board. The board is empowered, on the complaint of ten persons affected by the lack of accommodation in a station or by failure to keep it in proper repair, to make an investigation and order what shall be done to rectify the grievance. After January 1, 1907, passengers standing on the side steps of a car, while in motion, are to be punishable by fine. The cars are to be so constructed as to prevent, if possible, passengers standing on the side steps. The board is empowered to conduct inspections of railways. It may also make orders in regard to the use of safety appliances.

The construction of urban and interurban electric railways is very active in Ontario and, on this account, the regulative provisions of the legislation, while applying to railways generally, are especially interesting in the case of railways using electricity as a motive force. Street railway franchises are limited to twenty-five years. The legislation does not, however, affect franchises already granted. In the case of radial, or interurban lines, when an agreement as to the terms on which such a line is to enter a municipality cannot be arrived at the matter is to be submitted to the board for adjudication. This is, however, subject to the limitation that existing agreements between the street railway operating within its limits shall not be varied without the consent of the municipality. Otherwise a street railway by acquiring a radial line might obtain modifications of the original franchise granted by the city. A very radical change is made by the provision that, where a dispute arises between a municipality and a railway in regard to the construction and enforcement of agreements which such a municipality may have made with a railway or a street railway operating on highways, the board may, in default of a satisfactory observance of the agreement, take over complete control of the line until the provisions of the agreement are observed. This is intended to be a club to be used only in the last resort.

No contracting-out of liability for death or injury is permitted, and agreements to permit such contracting-out are void. No operative, on a railway over 30 miles in length, who has been on duty for 24 hours or over, is to be sent out again until he has had 12 hours' rest.

Certain more general powers are given in regard to municipal affairs, public utility companies, and labor disputes. The board is to hear various appeals in regard to assessments which now go before the courts; and it is to exercise the powers which have hitherto been exercised by the cabinet under the municipal act. These powers cover questions concerned with the alteration of municipal boundaries, confirmation of financial by-laws, and by-laws concerning highways, bridges and public utilities. Telegraph, telephone, electric light, heat and power companies may be ordered to adopt such safeguards as the board thinks necessary in the public interest. The board is given power to arbitrate disputes arising between a railway or street railway and its employes. The matter is to be brought before the board by the application of the parties to the dispute; and the application must contain an agreement to accept the finding of the board in the matter and to continue at work without a lockout or strike during the investigation. It does not appear whether the law contemplates action where application is made only by one of the parties. The order of the board is to have no compelling power, the agreement to accept its findings being only an agreement in honor. Where there is a strike or lockout of the employes of any railway or public utility company, or where there is a danger of there being such a strike or lockout, the board is empowered to attempt to obtain a settlement. If it is unable to obtain results through conciliation it is to appeal to public opinion by publishing its findings and making such recommendations as it deems fit. It is apparent that where the parties to the dispute are unwilling to avail themselves of the board's good offices the findings will depend on a partial statement of facts. It may be noted, in passing, that a suggestion that somewhat similar powers should be conferred upon the Dominion Railway Commission was continued in one of the reports preliminary to the organization of that commission.

In general the board is, through its reports annual and occasional, to act in an advisory capacity to the legislature in regard to railway and to municipal legislation.

In the organization of the Dominion Railway Commission control over the commission's actions was retained to parliament by authorizing an appeal from the commission to the cabinet; and at the same time authorizing the cabinet to overrule, of its own action, an order of the commission. The reason for this arrangement is that the regulation of railways by the Dominion has always been looked upon as a legislative matter. By placing a supervisory control in the hands of the cabinet, which is itself responsible to parliament, it was intended to preserve the principle of ministerial responsibility. In the Ontario legislation, however, a constitutional departure is made by permitting no such appeal to the Ontario cabinet. The findings of the Ontario commission, like those of the Dominion commission, are final on questions of fact. On questions of law and of jurisdiction there may be an appeal to the court of appeals. There is, however, a considerable expansion of the right of appeal in the provision that when the matter involved amounts to more than $4,000, or where there is a question of the duration of a franchise, or of the construction of an agreement between a railway and a municipality, or any demand affecting the present or future rights of the public there may be an appeal to the privy council in England.

The commissioners appointed hold office during the pleasure of the government and must give their entire time to the performance of their duties. They are not permitted, either directly or indirectly, to have any financial interest to the railways subject to their jurisdiction. Nor are they permitted to act as officers or as directors of any company which has power to invest in the securities of such railways. The scale of salaries is not high—$6,000 for the chairman of the commission, $4,000 each for the other two commissioners, and $2,000 for the secretary. Following the defective provisions of the Dominion legislation, and for that matter of nearly all commission legislation, there is no provision in the Ontario legislation for qualifications of technical fitness to be possessed by the commissioners. The chairman of the commission has been active in law and in municipal affairs; of the other two commissioners one has occupied minor positions in the railway service and has been a railway contractor. Until recently he has been a member of the Dominion parliament. The third member of the commission is a wholesale grocer.

It will be noted that especial attention is devoted to the regulation of street railways. While attention has been paid to the Massachusetts legislation it has not been followed in the matter of regulation of capitalization. Any increase in the capital stock of a company must receive the approval of the board. But the board has no supervisory power over the way in which the sums so raised are to be expended. Nor has it any control over bonded indebtedness.

In the control of rates the legislation does not go so far as the Dominion legislation. The passenger fares on electric railways, including street railways under this heading, are controlled by maximum rates. The fares are not to exceed five cents per passenger per mile for any distance not exceeding three miles; when the distance is in excess of this the maximum rate is to be two cents a mile. In the case of railways, i. e., other than electric railways, by-laws containing the rates intended to be charged are to be drawn up by the railways. These are subject to the approval of the board. The board has power to approve these by-laws, in whole or in part, and has also power to modify them. The rates so dealt with are maximum rates. The board, however, is not given power to modify the rates once they are operative, nor is it given any power to make amendatory rates for the future. The control over rates exercised by the board includes also a similar supervisory power over Pullman car charges.

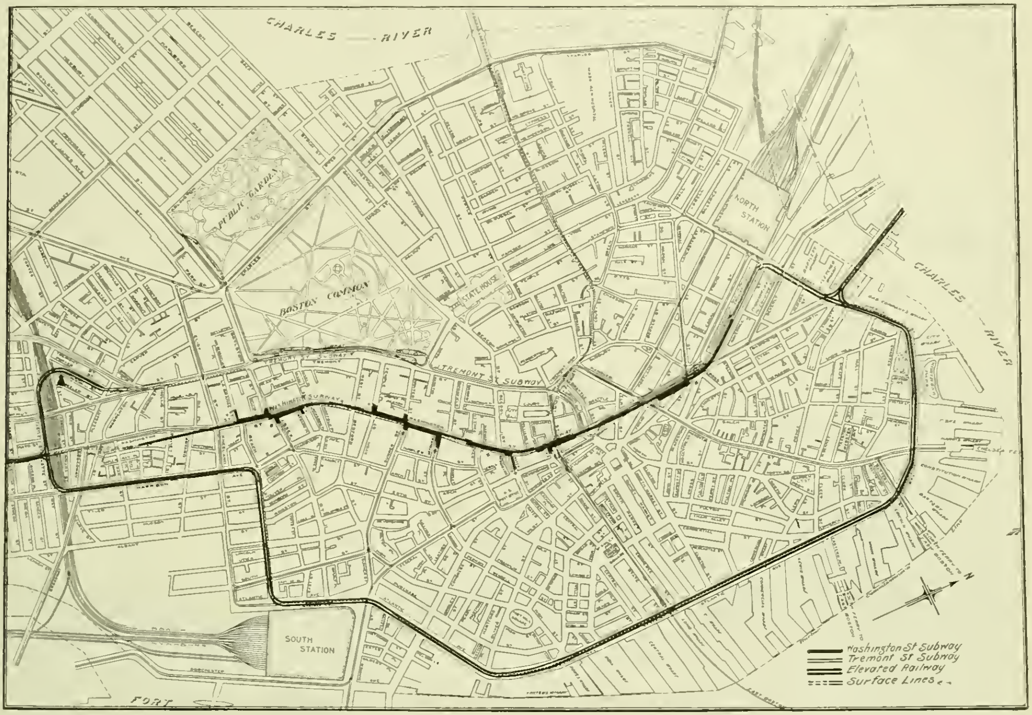
Some interesting constitutional questions will develop in connection with the delimitation of provincial powers in regard to railways. The legislation limits the jurisdiction of the board to railways within the provincial jurisdiction, exempting government railways. This follows the Dominion legislation. In Ontario the only line thus exempted is the Temiskaming & Northern Ontario Railway, running northward from North Bay towards James Bay, traversing on its way the cobalt silver deposits of northern Ontario. The question has yet to be faced what lines are really within the provincial jurisdiction. While there is not the sharp distinction, in Canada, between intra-provincial and inter-provincial traffic which exists between intra-state and interstate traffic in the United States, and which has so complicated the question of regulation in the latter country, at the same time it was, in general, intended that intra-provincial lines should be within the control of the provinces. This has, however, been subject to the provision that lines declared to be "for the general advantage of Canada" were, even if they lay wholly within the boundaries of a province, to be placed under the control of the Dominion parliament. At first this was construed strictly to mean that a railway which was to form part of an inter-provincial railway was the type aimed at. Later a greater elasticity of interpretation developed and in many cases lines lying wholly within provincial boundaries received Dominion charters without much attention being paid to the matter. Roads have been desirous of obtaining Dominion charters for various reasons. It has been felt in some cases that the possession of a Dominion charter would facilitate the obtaining of a subsidy from the Dominion. In some cases it has been thought that wide powers might more readily be obtained from the Dominion, while in other cases it has been felt that the possession of such a charter would give the railway a better status when endeavoring to place its securities.

The adoption by the Dominion, in the early eighties, of a policy whereby subsidies were granted to railways which were distinctly of local interest still further aided in the gravitation of increased power, over railways, towards the central government. Protests against this tendency were made at an early date. In 1884 the province of Ontario memorialized the Dominion stating that roads within the province had been subsidized by the province and the municipalities to the extent of $14,000,000; that this aid had been granted on the faith and understanding that the roads were to be under provincial control; and that since the Dominion government had by the implications of its legislation declared they were for the general benefit, the moneys already expended upon them by the province and the municipalities should be refunded. In 1887 a similar protest was made by Nova Scotia. From time to time the Dominion government has, in a somewhat haphazard manner, recouped provinces for expenditures on railways which have been subsidized by provinces and later brought under Dominion control. The largest payments of this nature have been made to Nova Scotia and to Quebec. In Ontario one small reimbursement has been made to a municipality.

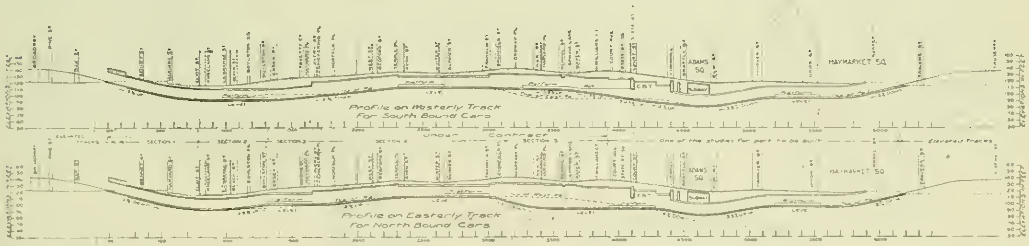
Of recent years there has been more active protest against the encroachments of the Dominion parliament upon the field of provincial activity. This has been especially noticeable since the construction of interurban electric railways began. An electric railway of local interest might apply to the Dominion for a charter. Its charter provisions might enable it to acquire other electric railways. If, under this arrangement, a consolidation of the railway were effected with a street railway then the result would be that the street railway, lying wholly within the boundaries of a city, might become subject to the jurisdiction of the Dominion. Protests have been lodged against such legislation on the grounds that it is an infringement of local home rule, and that a local body, being closer to the facts, is better able to safeguard local interest. While the protests have not been limited to Ontario alone, it is Ontario that has been most active in protest. While the new Ontario legislation was pending a charter was granted to the Hamilton Waterloo & Guelph Railway, an electric road lying wholly within the province of Ontario. A protest was lodged by the province of Ontario, saying that this infringed upon the jurisdiction of the province. A few days ago an application was made to the Dominion parliament to keep in existence the charter rights of the Pacific & Atlantic Railway. This enterprise, which proposes to construct a railway from Glengarry to Sault Ste. Marie, was chartered twenty years ago by the Ontario legislature. The province of Ontario lodged a protest saying that this railway should be under provincial jurisdiction. The situation is complicated by the fact that the province of Ontario is urging that Dominion assistance should be given to the Temiskaming & Northern Ontario Railway. It is true that it is urged that this railway, which lies wholly within the province, is of interest to the Dominion in that when it is built northwards to a junction with the Grank Trunk Pacific it will facilitate the movement of supplies for the construction of that railway. The fact that the Temiskaming railway is a government venture will suggest how complicated the situation is. Now that there is a railway commission in Ontario the question of the delimitation of the powers of the provinces and of the Dominion will be kept to the front. It is probable that there will be a conference between the provinces and the Dominion to deal with the whole matter. The Hon. Mr. Emmerson, the Dominion minister of railways and canals, has expressed the opinion that, through the instrumentality of such a conference, an amendment to settle the vexed question may be drafted and incorporated in the British North America act.

STATION LOCATIONS IN THE WASHINGTON STREET TUNNEL, BOSTON.

One of the most interesting and important features of the tunnel now being built under Washington street in Boston by the Boston Transit Commission is the location of stations along this new rapid transit route. In anticipation of a heavy traffic through the tunnel, the station platforms have been planned with a minimum length of 350 feet, which is sufficient for the handling of eight-car elevated trains of the dimensions of those now operating in Boston on the overhead structure and in the Tremont street subway. The stations have been located with particular reference to the needs of the shopping and retail business district, but the tunnel as a whole has been designed for the requirements of through travel.



Washington Street Tunnel, Boston—Location of Line and Stations.

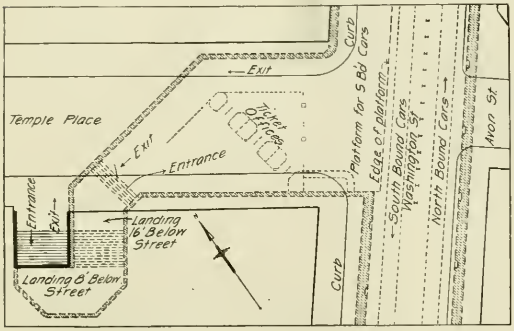

ADAMS SQ
HAYMARKET SQ
Profile on Westerly Track For South Bound Cars
Under Contract
Elevated Tracks
ADAMS SQ
HAYMARKET SQ
Profile on Easterly Track For North Bound Cars

Washington Street Tunnel, Boston—East and West Track Profiles.

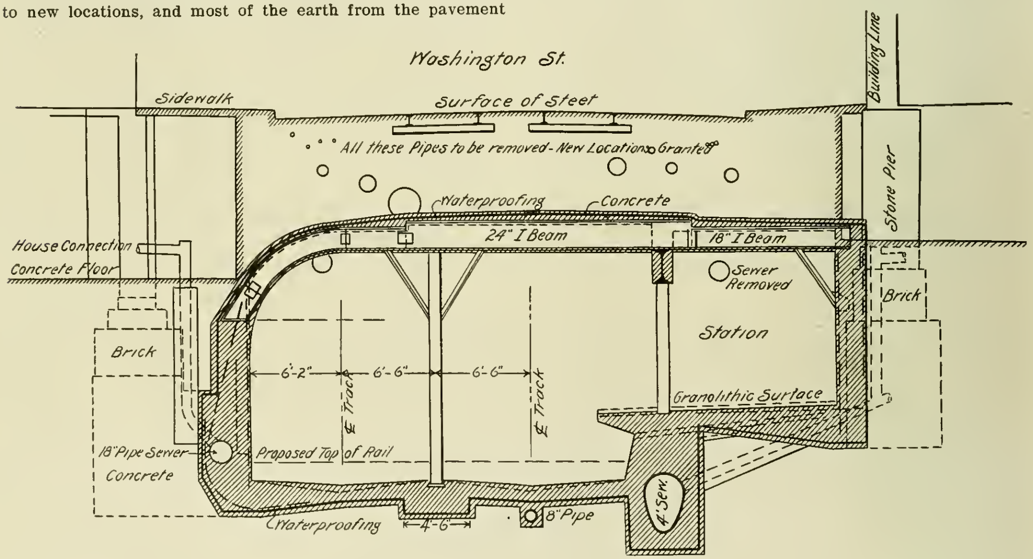
The accompanying map shows the general location of the Washington street tunnel with the station platforms indicated by the wider lines. In comparison with the Tremont street subway, the alignment and grade of the new tunnel are far less objectionable from the standpoint of train operation. The Washington street tunnel is about 1¼ miles long exclusive of inclined approaches; of this length 50 per cent is straight, 33 per cent has a curvature with about a 5,000-foot radius, 2 per cent with about an 1,800-foot radius, and 15 per cent with about a 500-foot radius. In the matter of grades, 40 per cent of the tunnel is level, 7 per cent has a grade of less than 1 per cent, 22 per cent has a grade of about 2 per cent, 13 per cent from 3¼ to 4 per cent grade, and about 18 per cent of the length is 5 per cent grade.

One of the illustrations shows the tracks of the tunnel in profile. The lowest point in the tunnel is under the Tremont street subway at Adams square. Here the track will be about 52 feet below the level of the present elevated structure on Causeway street, a rise which each northbound train will have to make. In the old Tremont street subway there is a descending grade of 8 per cent, a curve of but 85-foot radius and a considerable number of curves of 90 to 125-foot radius. The limiting speed on curves is therefore 20 or 25 miles per hour in the tunnel as compared with 9 or 10 miles per hour in the present subway.

In passing, it is worth noting that in no place does the tunnel come far from the building lines, as may be seen by the typical cross section taken near the corner of Temple place and Washington street. At certain points en route, extraordinary efforts had to be made to reinforce properly the adjacent building foundations. On account of the narrowness and irregularity of the streets and the frequency of the tunnel station platforms, the cross section of the tunnel is exceedingly irregular and is rarely uniform for more than a few feet in length. A large number of sewers, pipes, conduits and other underground structures had to be moved to new locations, and most of the earth from the pavement down to the bottom of the tunnel had to be carried away. Traffic on the street was interfered with very little. As the tunnel construction advanced the paved surface of the street has been replaced with heavy planking laid flush with the original surface of the paving and supported on timbers, and most of the work during the daylight hours has been done under this bridging. Surface cars were not diverted in the day time from their usual routes except in cases of emergency, but at night and on Sundays routing has often been altered, though space has been left for the passage of fire apparatus through the street.



Washington Street Tunnel, Boston—Entrance and Exit.



Washington Street Tunnel, Boston—Typical Section.

Stations are provided in the new tunnel at Essex street, Summer street, State street, and Haymarket square, north-bound, and at Haymarket square, Milk street, Winter street and Boylston street, south-bound. Entrances are also planned north-bound at Hayward place, Franklin street, and Hanover street, and south-bound at Hanover street, Water and Devonshire streets, Temple place, and Lagrange street. The official designation of these different stations awaits the completion of the tunnel and the inauguration of service therein by the Boston Elevated Railway Company. Referring to the map, the striking feature of the tunnel is its relative straightness, and after this, the frequency of station platforms in the shopping district. A station entrance is found here at practically every block, for one side or the other as the case may be. There are two stations in the heart of the shopping district, and there is little doubt but that these will reduce the present sidewalk congestion by distributing instead of concentrating foot traffic. It will also reduce the street congestion by reducing the number of surface cars on the street.

Consideration of the volume of traffic on the sidewalks and streets in connection with the width of those sidewalks and streets convinced the Rapid Transit Commission that it would not be expedient to take any portion of the sidewalk or the roadway on either side streets or on Washington street for entrances to the stations. It was determined, therefore, to "stagger" the north and south-bound platforms, and to equip the stations with separate platforms for the traffic in each direction, making the entrances as far as possible on private property and on side streets. An illustration is presented of the south-bound entrance and exit to the platform at the Temple place station. This is typical of the entrances and exits. The arrangement of ticket offices, turnstiles, etc., is only tentative, and is subject to the wish of the Boston Elevated Railway Company. The platforms will be on the same level as the floors of the train platforms, so that no steps will have to be taken up or down in entering or leaving trains. Although the entrance and exit stairway is narrow on account of the small space available on the street surface, the passageway widens rapidly as one approaches the station platform in the tunnel. In general, there are steel columns in the middle of the cross section between the north and south-bound tracks. This arrangement was objectionable to the commission in the old subway, but is less objectionable here for the reason that the two tracks of the tunnel are in general at somewhat different levels in any particular locality.

The State street station is convenient to the business district and is also the point of connection with the East Boston tunnel, and will have physical connection with Scollay square, one of the most important traffic centers in Boston. At State street the Washington street tunnel passes beneath the East Boston tunnel.

The station near Milk street will have a small superstructure on a now vacant lot.

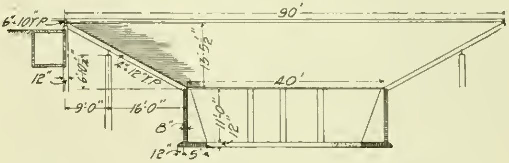
The Washington street tunnel stations in the main are located about 500 feet east and practically opposite the corresponding stations in the Tremont street subway, except that the Old South Meeting House station has no corresponding station in Tremont street. When the tunnel is completed there will be certainly twenty rapid transit stations in the business district of Boston. No point in the commercial section will be over five minutes' walk from some station on the elevated system. The transfer of the elevated trains from the old subway to the new tunnel and the restoration of through surface car routes in the former will bring about many problems in the disposition of traffic. The Washington street tunnel is still far from completion, and it is doubtful if it will be ready for operation before the latter part of 1907 or early 1908. The station locations, however, already show how thoroughly the transit situation has been examined and studied by the commission and the Boston Elevated Railway Company with a view towards giving the public the best possible service.

In Germany, according to the Railway World, experience has proved that the usefulness of a beech tie is prolonged 50 per cent, its life being extended from 18 to 27 years, by a preservative process. In this country the preserving process is costly, because of the high price of creosote oil.

The oil is a by-product of gas plants, and was formerly thrown away as waste. A company ascertained its value and made long-time contracts with the gas-making companies for their entire output. In this way most of the oil of creosote was thoroughly controlled, and its price easily regulated. The steam railroads consume over 84,000,000 ties annually, equal to 3,000,000,000 feet of lumber, board measure. To that may be added the requirements of the trolley roads.

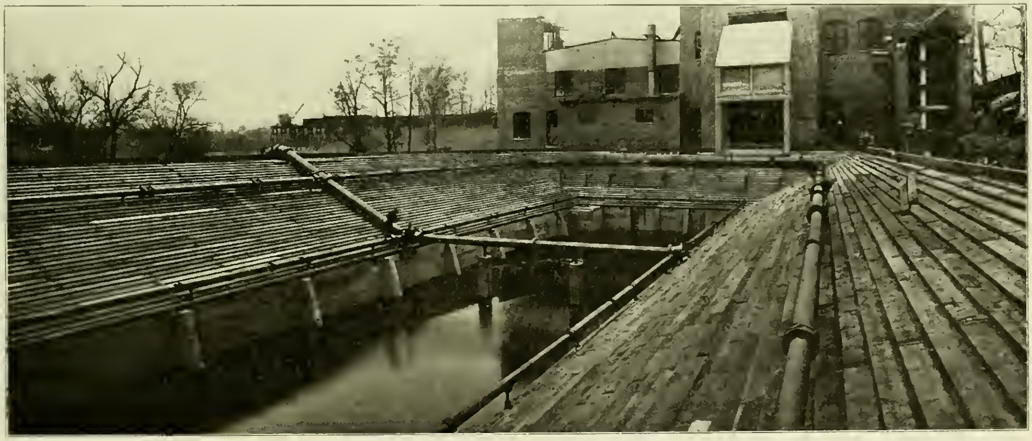
COOLING POND AT SECOND STREET AND WYOMING AVENUE POWER STATION, PHILADELPHIA RAPID TRANSIT COMPANY.

In former issues we have illustrated the application of spray nozzles for distributing water in connection with cooling ponds for power stations. ("Power Plant of the Chattanooga Electric Company," Street Railway Review, March 15, 1905, page 136 and "Power Equipment of Philadelphia Rapid Transit Company—Ogontz Station," Street Railway Review, September 15, 1905, page 529.)



Cooling Pond Philadelphia Rapid Transit Company—Cross Section Showing Construction Details.

The Philadelphia Rapid Transit Company has recently completed a cooling pond at its Second street and Wyoming avenue power station, which is especially interesting as showing an economical method of construction. It was desired to have a reservoir for a reserve supply of boiler feed water at this station, and it was decided to make this a cooling pond for condensing water as well. The pond proper is rectangular in section 40 feet wide by 145 feet long and 11 feet deep. The walls and bottom are made of reinforced concrete, the bottom being 12 inches thick and the walls 8 inches thick. Interior buttresses 12 inches thick are placed at intervals of 16 feet along the walls; these project 5 feet at the bottom and 18 inches at the top. Surrounding this concrete basin are four aprons forming a hopper-like structure of timber, made of 2x10-inch pine planks laid on 4x12-inch yellow pine stringers, placed 8 feet between centers. The planks are lapped as in weather boarding. These aprons have a slope of about 60 degrees at the sides and about 40 degrees at the ends. At the sides the aprons are 25 feet wide and at the ends 17 feet 6 inches wide. The rafters which support the aprons surrounding the pond are carried on the concrete wall at the lower end and on I-beams which rest on a line of piers 16 feet from the basin at the sides and 10 feet 6 inches away at the end.



Cooling Pond Philadelphia Rapid Transit Company—Showing Completed Structure.

Near the edge of the basin is laid a ring of piping and outside of this a second ring, which comes immediately above the supporting I-beams mentioned. The discharge from the condensers is conducted to the pond through a 20-inch pipe connecting with the distributing rings by a transverse pipe (16 inches reducing to 14 inches) extending across the pond and tapping each ring in two places. For the outer ring nearer the distributing pipe the sections are 10 inches in diameter reducing to 8 and then to 6 inches along the sides and 6 inches at the ends. The inner ring is of 8-inch and 6-inch sections. At intervals of about 16 feet along each pipe ring there are placed spray nozzles manufactured by L. Schutte & Co., Philadelphia. There are 20 nozzles on the inner ring and 27 on the outer ring. The reduction in temperature effected by spraying the water is from 25 to 30 degrees F.

CEMENT TESTING LABORATORY, PHILADELPHIA RAPID TRANSIT COMPANY.

In view of the large amount of new construction contemplated by the Philadelphia Rapid Transit Company in which reinforced concrete would be used, the company in April, 1903, established a laboratory for the testing of cement, sand and stone, in order that the material might be thoroughly inspected and the quality kept up to specification. As the subway and elevated divisions have progressed, this testing laboratory has been charged with the duty of inspecting and testing paints and waterproofing material.

The cement laboratory is now located on an upper floor in one wing of the company's new rotary-converter substation at No. 812-820 Sansom street, Philadelphia, and is in charge of Mr. Samuel A. Brown, with the title of inspector of cement, who has three assistants on this work.

Because of the extent to which reinforced concrete is being used in railway work, the specifications for Portland cement as adopted by the Philadelphia Rapid Transit Company in 1903, and amended to date will be of interest, and are given herewith:

Philadelphia Rapid Transit Company Specifications for Portland Cement.

The specifications given below are intended to cover Portland cement required for the use of this company during the year 1906:

Material to be delivered in canvas bags, each bag to contain 94 pounds net. Barrels, upon which prices will be received, to be considered as containing four bags each. The bags to be charged at not to exceed ten cents each, and a corresponding rebate to be given on all bags returned f. o. b. shipper's mill.

Each package shall be plainly marked with the name of the brand and of the manufacturer.

All cements shall be subject to inspection, and will be required to meet the tests herein prescribed, and cement which is rejected shall be immediately removed from the work and its vicinity by the contractor, without cost to the company. The failure of a shipment of cement to meet the tests shall constitute a sufficient reason for the prohibition of the further use of the brand of cement so failing, on any part of the work, unless the chief engineer shall determine that such failure is unusual or due to accidental causes.

Cement must equal in quality the best grade of American Portland cement, and preference will be given to brands of established reputation.

The fineness of the cement shall be determined on sieves known as the No. 100 and No. 200, of brass wire cloth having approximately 10,000 and 40,000 meshes per square inch, the diameter of wire being 0.0045 and 0.0024 inch, for No. 100 and No. 200 sieves respectively. The cement shall leave a residue by weight of not more than 8 per cent on the No. 100 sieve, and not more than 25 per cent on the No. 200 sieve.

The cement shall have a specific gravity of not less than 3.10.

Cement mixed neat to form a paste of normal consistency, the surrounding temperature as near to 70 degrees F. as practicable, shall not develop initial set in less than 20 minutes, and must have acquired its hard set in less than 10 hours. The cement is considered to have acquired its initial set when a needle one millimeter in diameter loaded to weigh 300 grammes ceases to penetrate within 5 millimeters of the bottom of a cake 40 millimeters deep, and to have acquired its hard set when the same needle ceases to make a visible indentation on the surface of the cake. The requirements for set may be modified by the chief engineer if found advisable for any part of the work, due notice in advance to be given to the contractor.

The cement shall pass the following tests for soundness:

For these tests, pats about 3 inches in diameter, ½ inch thick at the center, and tapering to a thin edge, should be made, upon a clean glass plate from cement paste of normal consistency. These pats shall be allowed to remain 24 hours in moist air before immersion in water or steam.

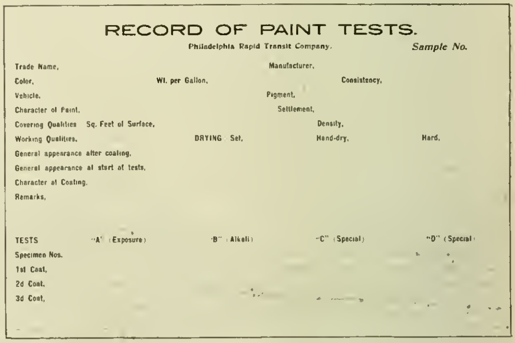
A pat is immersed in water maintained as near 70 degrees F. as possible for 28 days, and observed at intervals; the pat shall remain firm and hard and show no signs of cracking, distortion or disintegration.

A pat is exposed in any convenient way in an atmosphere of steam, above boiling water, in a loosely closed vessel, for 3 hours, after which, before the pat cools, it is placed in the boiling water below, for 5 additional hours.

To pass the accelerated test satisfactorily, the pats shall remain firm and hard, and show no signs of cracking, distortion or disintegration.

Cements failing to meet the requirements of the accelerated test will not necessarily be rejected, but shall be held until the results of the normal tests are examined, and will be subject to a repetition of the accelerated test 28 days after the delivery of the cement, rejection on failure to pass the final tests to be discretionary with the chief engineer.

Tensile tests shall be made on specimens prepared and maintained until tested at a temperature as near as practicable to 70 degrees F. Each specimen shall have an area of one square inch at the breaking section, and after being allowed to harden in moist air for 24 hours shall be immersed and maintained in water until tested, except for the specimens for the 24-hour tests, which shall be immersed in water after hard set. The sand used in preparing test specimens shall be clean, sharp, crushed quartz retained on a sieve of 30 meshes per lineal inch, and passing through a sieve of 20 meshes per lineal inch.


RECORD OF PAINT TESTS.

Philadelphia Rapid Transit Company. *Sample No.*

Trade Name, Manufacturer,
Color, Wt. per Gallon, Consistency,
Vehicle, Pigment,
Character of Paint, Settlement,
Covering Qualities Sq. Feet of Surface, Density,
Working Qualities, DRYING Set, Hand-dry, Hard,
General appearance after coating,
General appearance at start of tests,
Character of Coating,
Remarks,

TESTS	"A" (Exposure)	"B" (Alkali)	"C" (Special)	"D" (Special)
Specimen Nos.				
1st Coat,				
2d Coat,				
3d Coat,				

Card for Recording Paint Tests.

The tensile strength from test specimens shall be as follows:

NEAT CEMENT.	
24 hours (in water after hard set)............	150 pounds
7 days (1 day in air, 6 days in water)........	500 “
28 days (1 day in air, 27 days in water)........	600 “
1 PART CEMENT, 3 PARTS SAND.	
7 days (1 day in air, 6 days in water)........	170 pounds
28 days (1 day in air, 27 days in water).......	240 “

The cement shall not contain more than 1.75 per cent of anhydrous sulphuric acid.

The rules recommended by the committee of the American Society of Civil Engineers, on Uniform Tests of Cement, as published in Proceedings of the said society for the month of January, 1903, will be followed in making the above tests.

Two of the assistants in the laboratory are employed principally in taking samples of cement, this work being relatively expensive because of the widely separated points where cement is received. As a matter of convenience the laboratory is notified by telephone when a consignment is received, but formal written notice, stating quantity, date and place of arrival, car numbers and initials, place of storage and place of intended use, is mailed by the engineer in charge. To comprise a sample which is assumed to represent a car load (680 bags) about one pound of cement is taken from each of 10 bags selected at random in the car.

The cement tests made in the laboratory are seven in number, as follows:

1. Time of setting.
2. Fineness.
3. Specific gravity.
4. Tensile strength, neat.
5. Tensile strength, mixed with 3 parts sand.
6. Soundness.
7. Anhydrous sulphuric acid.

With a new brand the first determination is of the amount of water necessary for the proper mixing, and after this is known (the Vicat needles being used in testing) the test pats and briquettes are made with the proper amount of water carefully measured.

The tests for time of setting and fineness are described in the specifications covering these points.

The determination of specific gravity is made by weighing the cement dry, and then finding its volume by putting it into Le Chatelier graduated flasks filled with kerosene, and noting the displacement in cubic centimeters. Using the metric system, the weight in air divided by the volume gives the specific gravity direct.

In making briquettes the materials are mixed by trowel and kneaded by hand for 2½ minutes as indicated by a sand-glass, and are moulded in batches of five in gang molds. The sizes of briquettes, time of immersion and required strengths are noted in the specifications. Ten briquettes neat and ten with 3 parts sand to 1 of cement are made up from each sample.

For tensile tests an Olsen 2,000-pound testing machine with the weights driven by a 1/20-horsepower Sprague motor, and a Fairbanks shot machine are used, the latter principally for one-day briquettes.

To test the soundness of the material three pats are made from each sample, one for the accelerated (or steaming and boiling) test, one for normal water test and one for normal air test, and after 24 hours in moist air (that is, stored in a covered box having water in the lower part) are put in the steamer for accelerated test, in tanks of water, or on the air-racks, as the case may be. All pats for the normal water test are kept immersed after the test period has elapsed and are available for further observation. The pats for accelerated test, after that test, are stored in the air test racks.

The laboratory is equipped for making complete chemical analyses. In determining the proportion of anhydrous sulphuric acid in the cement the photometric method is used ordinarily, unusual results being checked by a gravimetric analysis. The photometric method is preferred because of the greater rapidity with which tests may be made. For this test one gram of cement is treated with 10 to 15 cubic centimeters of one to one hydrochloric acid in which the sulphates present are soluble. After filtering and washing into 100 cubic centimeters of filtrate, two grams of barium chloride crystals are added to the filtrate precipitating barium sulphate.

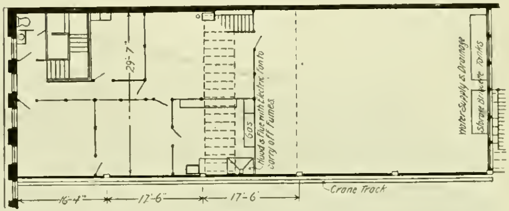
The photometric testing device consists of a graduated tube set in a metal cylinder with the bottom, which is open, 3 inches above the base of the flame of a standard candle (that is, one giving one candlepower), and the test is made by pouring the agitated filtrate containing the barium sulphate precipitate in suspension into this tube until the image of the candle or flame is no longer visible from above. The depth of filtrate necessary to obscure the image of the flame being determined, reference to a table gives the proportion of anhydrous sulphuric acid in the sample analyzed. It should be noted that the laboratory is not so extravagant as to use standard candles; instead it uses commercial candles which are calibrated by comparison with a standard.

After the cement has been subjected to all the tests required, a letter of advice is sent to the engineering department describing the cement to which the test relates and giving a memorandum of the results. The report being satisfactory, it is approved and the contractor notified that the cement may be used in the work specified.

During the progress of the work on concrete structures, samples of the concrete are taken and moulded into 6-inch cubes, a record being made of the weather conditions, location on the work, the contractor, the brand of cement, time made, temperature, proportions of the concrete, consistency, size and kind of stone, sand and percentage of loam. Three cubes are made at a time, one for test under compression after 27 days, one after three months and the third after six months. These cubes are exposed in the air, inside or outdoors, or placed in damp sand according as the concrete from which the samples were taken is normally exposed to similar conditions. This field work testing is done under the direction of the inspector of cement and enables the department to verify the character of the material in the structure.

Considerable work has been done by the laboratory in testing and analyzing sand, gravel and stone intended for use in concrete work, the fineness, percentage of voids and heaviness being determined.

In testing paints, the paint is applied to a 12x12-inch sheet of steel which has been placed under a sand blast and all rust removed from the surface. The objection may be made that this freedom from rust is not a normal condition, but for the purpose of comparison it is essential that the surfaces to which the paints are applied be always in the same condition, and this can only be secured by having them free from corrosion. These test plates are exposed on the roof of the building if the durability under ordinary atmospheric conditions is to be determined. A record of paint tests is kept upon a card 6x9 inches, which is reproduced in reduced dimensions herewith. Waterproof coverings, special paints, etc., are in many instances applied to smaller test sheets and placed in solutions of various kinds to test the durability under unusual conditions.



Cement Testing Laboratory, Philadelphia Rapid Transit Company—Floor Plan.

ELECTRIC CAR BRAKES NEEDED IN ENGLAND.

Mr. Albert Halstead, United States consul at Birmingham, England, makes the following report on the opportunity for selling electric car brakes in Great Britain:

"While the speed of electric cars in the United Kingdom does not average as high as that of similar cars in the United States, there seems to be a growing danger to passengers on the British street cars by reason of the increasing use of electricity as propelling power. Accidents have occurred lately in the United Kingdom from cars getting beyond the control of the motorman, in the most recent of which three people were killed and a number injured. Authorities who have control of the running of electric cars in the Kingdom are now inclined to insist upon better and more effective brakes for such cars, it being argued that recent accidents would have been averted had the cars been supplied with suitable brakes. It would seem as if this attention to the question of proper brakes on electric cars should offer an immediate opportunity for American manufacturers of electric car brakes of all standard kinds to push their sales in the United Kingdom."

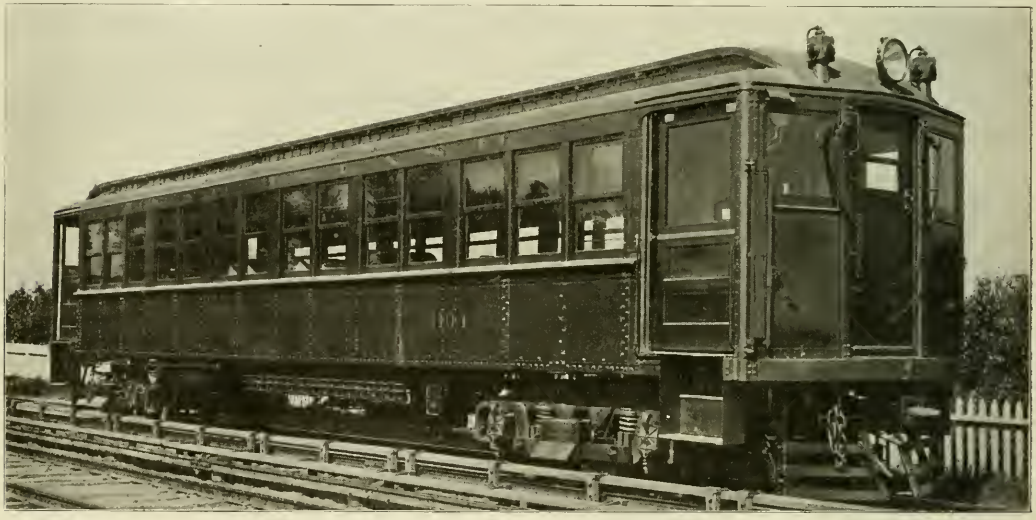
ELECTRIC CAR EQUIPMENT OF THE LONG ISLAND RAILROAD.

BY W. N. SMITH.

The design of the car equipment of the Long Island Railroad is based upon a careful study of the traffic conditions, calling for trains with the number of cars varying from two to six per train at different hours of the day, in regular operation, while heavy excursion travel to the beaches and racetracks would occasionally require trains of 10 or 12 cars. Some of the service is express and some local. It was deemed of the greatest importance to provide a single type of equipment that should be uniformly available for all the varying conditions of train service.

The fact that the Atlantic division is partly in a subway, and the need for interchangeability with the rolling stock of the Interborough Rapid Transit Subway, had much to do with the design of the cars. The complete success of the first all-steel passenger cars ever built, and which were designed by Mr. George Gibbs for the New York subway, led him, in his capacity as chief engineer of the Long Island Railroad electric conversion, to advocate their use on this road as well. To the Interborough Rapid Transit Company and the Long Island Railroad Company belong, therefore, the distinction of being the first railroads in the world to adopt this radical departure in car construction, thus insuring to the public complete immunity from the danger of fire in cars equipped with apparatus carrying powerful electric currents. The incidental advantages of these steel over wooden cars in superior strength and durability are, of course, likewise of importance in insuring their adoption. As the Long Island Railroad cars were obliged to meet very similar conditions, both as to the physical nature of the route to be traversed, and the class of travel to be handled, they were built along practically the same lines as the above mentioned steel cars for the New York subway. In fact, except for the steps which are made necessary by the low platforms at stations in the suburban districts, the steel car bodies are practically identical with those designed for the New York subway.

It has been common practice in the past to build passenger coaches for rapid transit service of rather lighter construction than the standard steam railway coaches, chiefly because the steam locomotive was universally used and it was desired to keep down to a minimum the weight behind the locomotive. The multiple-unit system of control, however, which allows the distribution of the motive power under all the cars, removes this restriction upon the weight and makes it possible to construct the parts of a suburban passenger car with more regard for rigidity, and greater ability to resist shocks. Multiple-unit cars for this kind of service can therefore be made as substantial as the requirements of safety and durability demand, but it should also be noted that the steel construction adopted does not materially increase the weight over what would be called durable construction in a wooden car, the increased strength and durability being secured without sacrificing operating economy.



Electric Car Equipment of the Long Island Railroad.—Steel Motor Car.

Car Bodies.

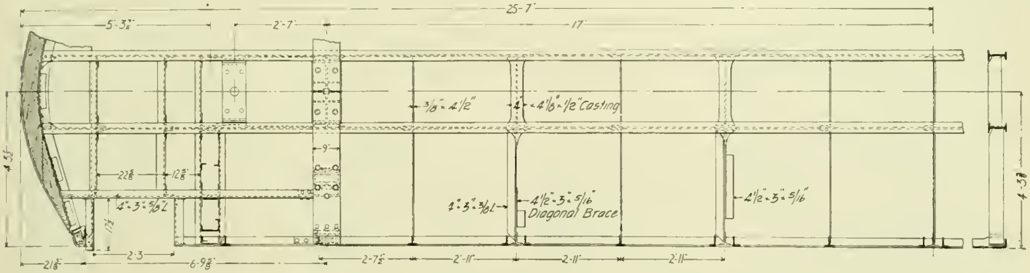
The principal dimensions of the steel car bodies are as follows: Length over body corner posts, 41 feet ½ inch; length over buffers, 51 feet 2 inches; width over side sills, 8 feet 6¾ inches; width over eaves, 8 feet 8 inches; width over window sills, 9 feet ½ inch; height from under side of sill to top of plate, 7 feet 1 inch; height from under side of center sill to top of roof, 8 feet 9¼ inches; height from top of rail to under side of sill at truck center (car light), 3 feet 3⅝ inches; and height from top of rail to top of roof with car light, 12 feet ¾ inch. The principal dimensions of the steel trailer cars are the same as those for motor cars, and they may, if desired, be readily converted into motor cars.

Car Body Framing.

While the conformation of the car body is practically identical with the conventional type of steam railroad coach, the adoption of steel as the constructive material is responsible for some differences in the general designs of car framing that have been hitherto followed in wooden car construction. These differences will appear in the course of the description, and are illustrated in the accompanying engravings. Most of the standard parts in the framing of the wooden cars have their counterparts in the framing of the steel car. The principal members of the car framing are of rolled steel shapes.

Reference to the accompanying engravings will indicate the general manner in which the framing is put together. The center sills consist of two heavy I-beams which are continuous between the platform and sills. The side sills are of heavy angles. Two extra sills, extending back to the body bolster, and composed of 4x3-inch angles, support the vestibule platforms.

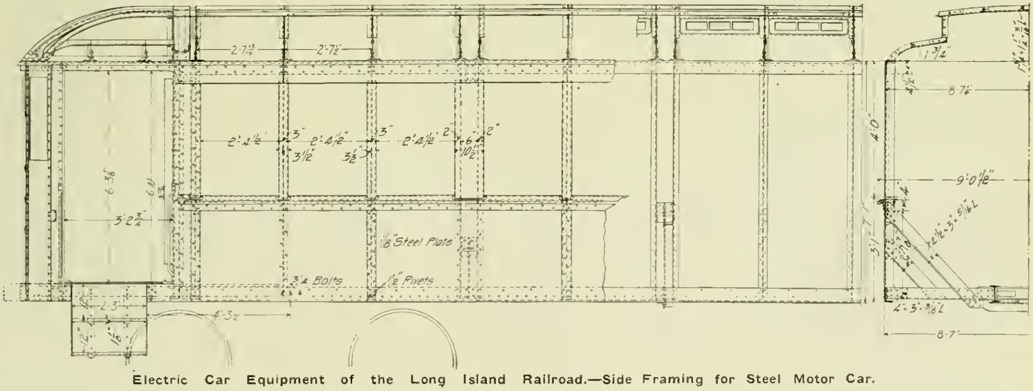
The bolsters are of the built-up type, the top and bottom members being made of two rolled steel plates, as shown in the engravings. They are machined on their outer ends to fit together perfectly, the top member being bent down over the bottom member and securely bolted to it. In the space between the top and bottom members and between the center sills is placed a malleable iron draw casting, machined so as to be a perfect fit between the bolster plates and the longitudinal sills to which it is bolted. Between the center and the side sills malleable iron struts are inserted. The top member of the body bolster is ¾x9-inch steel plate, and the bottom member of 1x9 inch-section. The body center plates are of cast steel, machined to fit the truck center plates, and the bottom member of the body bolster, and have their edges lipped over the bolster to which they are secured by heavy turned bolts in reamed holes.



Electric Car Equipment of the Long Island Railroad.—Plan of Steel Underframe.

The floor framing and the transference of the floor load to the side trusses of the car are different from the construction hitherto followed in wooden coaches. Needle beams and longitudinal underneath trussing are dispensed with, the construction being as follows:

The belt rail, side sills, and side posts are riveted together at their intersections, making a truss of square panels so reinforced by the ⅛-inch steel plate side sheathing of the car that they constitute a stiff truss without the necessity of diagonal bracing. Instead of needle beams and longitudinal truss rods, four sets of diagonal braces reach down from the side posts of the car below the belt rail, and are fastened to the bottom framing as shown in the sectional elevation. These braces are concealed in the backs of the stationary cross seats, so that their presence in the car is not evident after the seats are installed.



Electric Car Equipment of the Long Island Railroad.—Side Framing for Steel Motor Car.

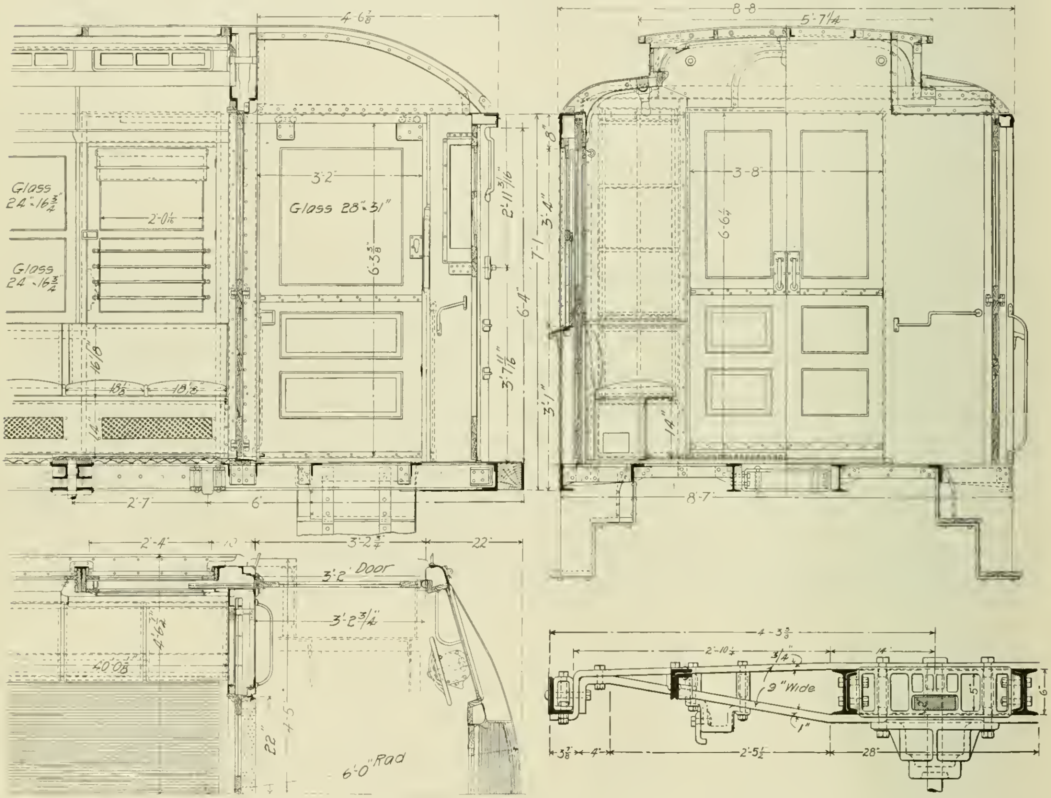
The bottom chords of the four cross trusses have riveted to them heavy steel castings which form struts between the two center sills, thus considerably increasing the stiffness of the bottom framing. The center sills are further stiffened by the introduction of the draw-castings for the attachment of the draft gear, and by the body end sill and platform end sill construction; also by numerous cross bridges.

The end sills of the car body are not made as continuous pieces extending completely across the ends, but are in the form of a double set of short pieces of angle bar fastened between the side and center sills by angle iron braces, making a stiff construction for holding the side and center sills rigidly in line. They constitute a set of box-framed struts, or filling in pieces, between the sills, at the ends of the car.

The body corner posts are also built up in a special form of construction. The corner post proper consists of an angle bar fastened to the end sill and the end plate, which is reinforced by a Z-bar, and also by the first side post of the car which is only about 10 inches back from the end and is riveted to the side sill and the side plate. The first post and the end post are practically made into one member by the ⅛-inch side sheathing, which is rounded into the form commonly used in the outside shape of the corner post of a car. This side sheathing is securely riveted by round head rivets to the angles and tees constituting the post, making an end post construction that is practically 3 inches thick and 10 inches long. There are 16 posts along each side of the car, of which six are compound, being made of two 3x2x¼-inch angles, spaced 6 inches apart. The remaining side posts are single 3x3x¼ inches.

To the top of the side posts are secured side plates of 4½x3-inch angles, which are not broken at the vestibule side doors, but are continued in one piece from end to end of the car vestibule hoods, where they are fastened to the end bows, which are of heavy angle bent into the proper shape to form the convex ends of the car vestibules.

The end plates of the car body framing are of heavy angles. They are in duplicate on account of the door pocket construction, and are framed directly across at about 4 inches above the level of the side plates, being connected to the latter by a pair of braces of heavy angles forming a sort of Z-connection. This enables the end plates to be raised high enough to admit of the insertion of the steel door rails at the proper height for carrying the sliding doors in the ends of the car body, and also facilitates the curving of the roof, which is somewhat lower than is usual in steam railroad practice on account of the clearances made necessary by the tunnel sections of the railroad.



Electric Car Equipment of the Long Island Railroad.—Cross Sections at End Showing Inside Finish.—Body Bolster.

Draft Gear.

The draft gear comprises a spring drawbar of the Van Dorn automatic type, supported on a section bar under the car platform, the radius bar being centered upon a pin set in a cast steel auxiliary bolster bolted to the center sills about 2 feet 7 inches in advance of the body bolster. Reaching back from this pin to the body bolster, where it is fastened in a similar way, is a continuation of the radius bar, the above mentioned pin construction being designed to form a sort of knuckle in the radius bar, which cannot be made long enough to reach all the way back to the body bolster because of the 90-foot radius curves around which the cars are designed to run. At either side of the drawbar, safety coupling chains have been provided, fitted with springs and anchor forgings fastened to the anti-telescoping plate under the platform end sill. To carry the weight of the radius bar, its outer end is carried in a sector guide directly over the drawbar proper, just back of the drawhead. The buffer beams are of oak, faced with ½x6-inch steel plates.

Roof.

The roof framing of the car consists essentially of the carlines made in a single piece of bent steel angles, reinforced by additional short pieces of angles at the bends which constitute the deck posts. These small angle reinforcing pieces are for the purpose of supporting the deck sills and furring strips to which the headlinings and roofing are fastened.

The roof carlines are connected by purlines of light steel angles. The carlines are secured to malleable iron castings which are riveted to the side plates, and the purlines, which are of about the same weight angle as the carlines, are riveted to the former with small angle braces. The carlines and purlines are faced with a furring of maple, secured by bolts, to which the roofing and headlining are fastened by wood screws. Maple blocks are also secured to the side plates, and hood bows, for the support of the roof covering and the headlinings. The deck sills and deck plates are of maple, so that the roof and its lining can be readily put up with wood screws.

A very light roof covering is used, consisting of composite board ⅜-inch thick, except over the vestibules, where it is of No. 16 gauge sheet steel, the whole being covered with heavy canvas laid on with white lead.

Vestibules.

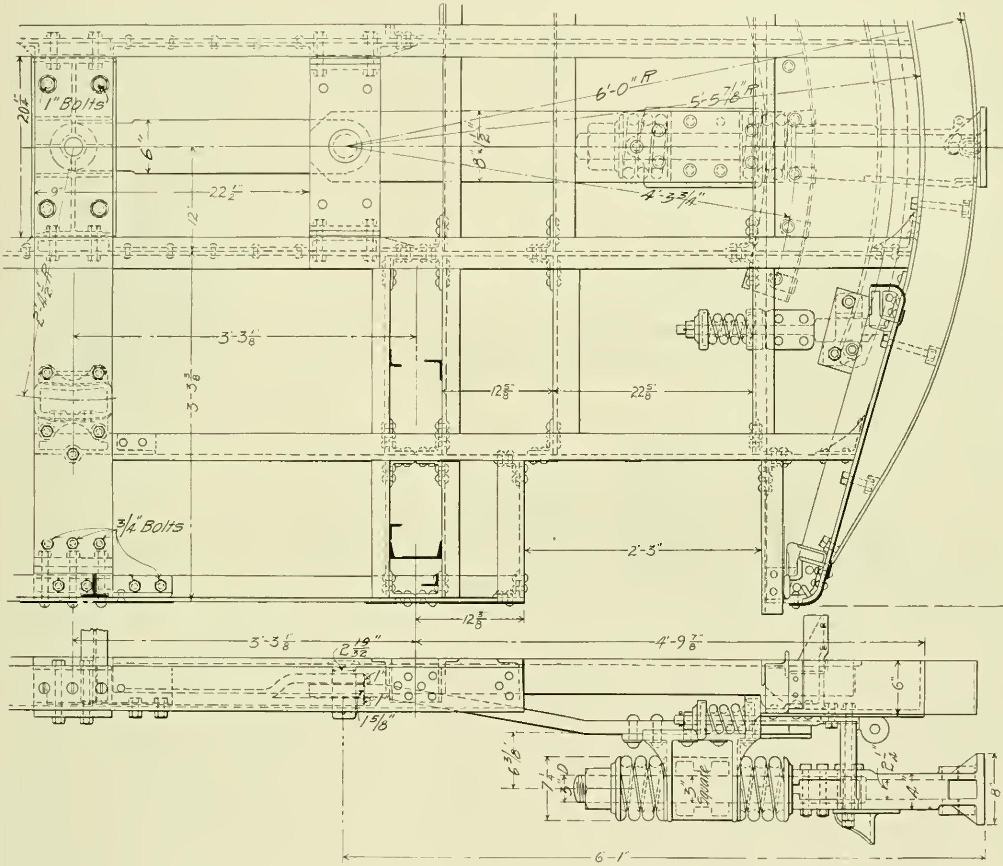
The vestibules are of the Gibbs patent type with floors of steel plates. The vestibule side doors are arranged to slide in pockets in the sides of the car, leaving the entire platform to the passengers. These doors close against pneumatic cushions so as to readily release the clothing of passengers if caught by the closing of the door. The device for operating the side doors consists of a series of bell cranks and levers so arranged that the movable parts are either overhead in the vestibule or entirely outside of it, leaving the entire interior of the vestibule clear. The side doors are operated by brakemen standing outside of the doors at the extreme end of the vestibule.

The body end doors are of the double sliding type and are fitted with a door coupling device that will hold them in any desired position to prevent them from closing when trains are rounding curves.

Sheathing.

The side sheathing of the car consists of steel plates ⅛-inch thick, their lower edges being flush with the bottom of the sill. The bulb angles which form the belt rail and the window sills overlap this sheathing. The post covers between the windows are of special pressed steel, flanged out at their lower ends to fit over the belt rail which runs along the entire length of the car body outside of the posts. The top ends of the post covers extend under the letterboard, which is a steel plate 7 1-16-inches wide, running the entire length of the car, riveted to side plates. The letterboard in turn is overlapped by the eaves moulding as described above. In this manner the entire outside covering of the car is waterproofed by simply overlapping its component parts, avoiding all cracks into which the water can run by gravity. All joints between the side sheathing plates are covered with sheet metal battons, laid on with thick red lead and secured by rivets.

There are 130 motor cars and four trailers, all of which were built at the Berwick, Pa., shops of the American Car & Foundry Company. They were personally designed by Mr. George Gibbs, chief engineer of electric traction of the Long Island Railroad, and a number of United States and foreign patents have been issued to him covering the various features of the construction. The photographic view of the completely equipped steel car shows the vestibule end door closed, as it appears when the vestibule is being used as the motorman's compartment.



Electric Car Equipment of the Long Island Railroad.—Draft Rigging for Motor Car.

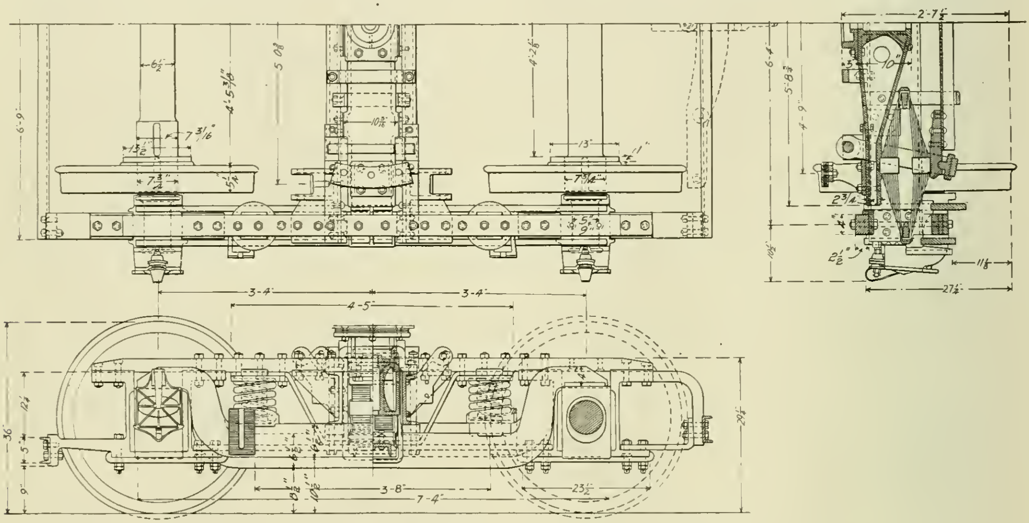
Trucks.

The motor and trailer trucks are of the M. C. B. type, the wheel base of the motor trucks being 6 feet 8 inches for 36-inch wheels, the trailer trucks having 5 feet 6 inches wheel base for 30-inch wheels. The distance between truck centers is 34 feet. The engraving shows the general plan of the motor truck, and its general dimensions are as follows: Gauge of track, 4 feet 8½ inches; wheel base, 6 feet 8 inches; weight of truck complete with two gears, but without motors, 13,800 lbs.; weight on center plate, with car body loaded, 30,885 lbs.; weight of one motor on truck transom, 3,500 lbs.; torque of one motor on truck transom, 3,000 lbs.

The truck bolster and truck center plates are steel castings machined to the proper dimensions. The side frames are of wrought iron, machined on four sides. All bolt holes in the side frames are accurately drilled to templates. The end frames are of steel channels. The pedestals are forgings lipped over the sides of the side frames and are machined on all surfaces where they have a bearing, either on the side frames, pedestal caps, or the journal boxes. The truck transom consists of rolled steel channels resting in the side frame castings, and provided with chafing plates of wrought iron.

Third-Rail Shoes.

The standard third-rail shoes on the Long Island cars are of the hinged slipper type, supported on the usual wooden beam, which is clamped against the notched face of the equalizer spring seat castings, providing means for vertical adjustment. Upon the center of the beam is placed a 600-ampere enclosed type fuse in a wooden box, with a hinged cover, and lined with asbestos. This arrangement is shown in detail in the photographic engraving.



Electric Car Equipment of the Long Island Railroad.—General Plan of Motor Truck.

Air Brakes.

The cars are equipped with hand brakes and with the Westinghouse "quick service" automatic air brake. This brake is of the new design developed from the quick action brake. Compressed air is supplied to the system by a Westinghouse D-2 electrically-driven air compressor on each motor car, controlled by a standard Form "J" Westinghouse governor. This pump has a rated capacity of 24 cubic feet of free air per minute, and supplies both the air brake and the pneumatic control system, but the brake and the control systems are operated from separate reservoirs.

The Westinghouse quick service brake differs from the standard apparatus in the passenger service in that it has quick serial service application, graduated release of cylinder pressure, quick charging of auxiliary reservoirs, and protection against over-pressure.

The quick serial service application is obtained by venting the train pipe air into the brake cylinders, in each service application, in the same way as is done by the quick action brake in emergency. The time required to fully set the brakes in service is in this way reduced approximately one-half as compared with the usual apparatus.

By means of the modifications above described, the air brakes are applied more rapidly and the distance required to stop the train is materially lessened. The efficiency of the brake is still further increased by the graduated release feature. The average time required for stopping the train in local service with this device is reduced from 30 to 40 per cent.

All the motor and trailer cars are provided with automatic slack adjusters which automatically take up the slack in the brake rigging and keep the piston travel uniform throughout the train.

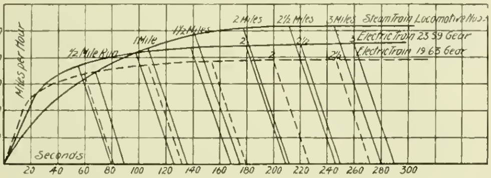
Electrical Equipment.

For the variable number of motor and trailer cars per train and the various classes of express and local service involving different schedule speeds and average lengths of run between stops, it was desirable to provide a uniform equipment, so that any car could be devoted to any desired type of service without discrimination.

Careful investigation showed that the greatest flexibility would result from a two-motor car equipment, using the most powerful motors practicable. The limitations were mainly the dimensions imposed by the largest trucks that could be operated under the conditions prescribed by the tunnel and curve clearances, which restricted the wheel base of the motor truck to 6 feet 8 inches. This restricted the size of the motor to about 200 horsepower, and the study of the conditions was consequently reduced to an examination of the characteristics and gear ratio most suitable for this motor, and of its power of endurance to resist overheating.

At the outset, a series of speed tests was made on various steam trains of the Long Island Railroad in order to compare the actual running time with that laid down in the time tables, and with the times which the railroad officials desired to be met by the electrical equipment. An ordinary passenger coach was fitted with speed-recording devices and a number of speed curves were obtained. The best performance of a relatively light steam locomotive train weighing 171.9 tons with the locomotive, is shown in the diagram. The difference in the running time of an equivalent electric train is also shown, and in general indicates that for all average lengths of run between stops in suburban service up to about two miles, the electric train is the faster. The average length of run over the Atlantic division, the first to be equipped, was originally estimated at 1.6 miles, but in practical operation since the road was equipped this has been reduced to about one mile, giving the electric trains a still greater advantage in speed, due, of course, to their higher rate of acceleration.

These same tests also throw some light on the time to be allowed for various delays to which the trains were likely to be subjected, and together with the actually derived speed curves, and calculated best performance curves, showed the relation between the schedule time ordinarily allowed for a train on a given run, and the best time that it could possibly make over the same distance.



Electric Car Equipment of the Long Island Railroad.—Speed Curves for Steam Train and Electric Cars.

An idea of the scope of the problem may be had from the statement that there had to be compared about 23 different types of train runs, local and express, on 8 different routes with the average distance between stops, (herein called average length of run) different in practically every case.

The general solution of the problem was worked out by the aid of speed-time curves, whose value for this purpose began to be recognized when electrical rapid transit problems first began to come up for solution on a large scale in connection with elevated railways.

The work of determining the equipment of any system, particularly one so extensive and interconnected as that of the Long Island Railroad, begins, therefore, with the railway motor performance as the principal starting point, and when the train requirements have been worked out carefully, the determination of the rest of the equipment is a matter of detailed computation. The general fitness for its work of the equipment actually selected, as proved by the operating results, has justified the care that was taken to work out the problem in a consistent and logical manner.

The general result of the motor computations, as determining the size of the car equipment, was that a medium gear ratio, (25:58 for the No. 113 Westinghouse motor) was fixed upon, and the number of motor cars and trailers per train was recommended in accordance with the following table:

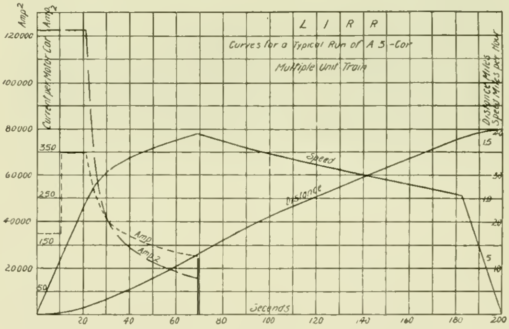
	Local		Express	
Cars in Train	Motor	Trailers	Motor	Trailers
2	2		1	1
3	2	1	2	1
4	3	1	2	2
5	3	2	3	2
6	4	2	3	3
7	4	3	4	3
8	5	3	4	4

Motors.

The motors are of the No. 113 Westinghouse type, both mounted on one truck. The cast steel frame is split at an angle of 45 degrees horizontally, the axle bearing being in the lower half. The armature can be taken out without removing the motor from the truck, by lifting off the top half of the frame; or the motor can be lifted entire from the truck by removing the gear case and axle caps. A nose suspension, with safety lugs which engage with the truck transom, is employed for this motor. The commutator cover is perforated, and openings in the bearing housings at the pinion end provide for ventilation which is practically effected by air being drawn in at that end and thrown out through the ventilating cover over the commutator, forming a continuous draft through the motor.

The armature bearings are solid phosphor bronze bushings, lined with 3-32-inch babbitt metal. The bearing at the commutator end is 7 inches in length by 4 inches in diameter, and at the pinion end 10 inches long by 4¾ inches in diameter. All the bearings are arranged for oil and waste lubrication. Oil is fed into the reservoirs through openings separate from the waste pockets so that it approaches the waste from below and is filtered by it before reaching the bearings. The reservoirs are easily accessible and oil can be readily kept at the proper level.

There are four pole pieces built up with soft steel punchings and bolted to the top, bottom, and sides of the motor frame. The field coils are flat and are formed of copper strap wound flat-wise and insulated with treated asbestos ribbon. The coils are held on the poles by brass hangers, independent of the bolts which secure the pole pieces. The armature is 19 inches in diameter, and is built up of soft steel punchings. Ample space is provided in the core for ventilation. The rotation of the armature draws air in from the outside through the openings in the housing at the pinion end, forces it through the interior of the armature spider, and through the openings in the core, thus securing a very thorough ventilation of the entire armature. The armature winding consists of machine-formed coils of copper strap insulated with mica and with oil and waterproof varnishes. The armature and commutator are mounted upon the same spider, which is of cast steel and is forced upon the 4¾-inch armature shaft at a pressure of about 40 tons and keyed in position. The commutator measures 16¾ inches in diameter and 10¼ inches along the face, and is compressed and keyed upon the armature spider. The brush holders are of the sliding type with phosphor bronze springs designed to give a uniform pressure upon the brush over a considerable range of wear. The tension of the spring can be adjusted without removing the brush holder from the motor. Each holder carries four brushes ⅝x2¼ inches in cross-section.



Electric Car Equipment of the Long Island Railroad.—Speed and Power Curve for a Three-car Train.

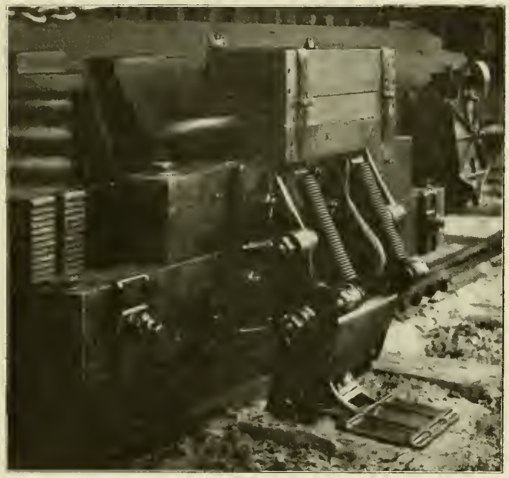
The pinion has 25 teeth, 2½-inch pitch, and is cut from a solid steel forging. It is keyed to a tapered seat on the armature shaft and held in place by a nut and lock washer. The gear has 58 teeth and is machined from solid cast steel and pressed and keyed to the axle. The diameter of the gear seat is 7 13-16-inches, and the face of the gear is 5¼ inches wide. The gear case is of malleable iron divided in halves horizontally and supported at both the front and rear ends by lugs projecting from the motor frame and housing.

Control System.

One of the most important features in electric railway development during the past eight years, has been the gradual perfection of systems of multiple-unit control where a number of motors distributed throughout a train can be readily controlled from either end of any one of the motor cars in the train.

The Westinghouse electro-pneumatic multiple control system was adopted for the cars of the Long Island Railroad. Its special features are as follows: Air operation of main switches, use of storage battery current for the control of main switches, indirect system of control from a small master controller with small currents and train line conductors, automatic progression of switch operation in starting a train, and protective features.

The advantage of air pressure as an actuating force for making and breaking switch contacts is that it permits an application of considerable power at the contact with relatively light and simple means, consisting simply of a piston working in an air cylinder, making contact by air pressure and breaking it by a powerful release spring when the air is exhausted. Contact is thus made certain, and welding is prevented at the contact points with the very heavy operating currents that have to be carried. On account of the great power obtained with a small amount of air, the switches can be constructed with large contacts and substantial parts.



Electric Car Equipment of the Long Island Railroad.—Third-Rail Shoe.

The use of storage battery current for controlling the main switches assures the certainty of action of the control entirely independent of the line pressure.

The indirect system of control involves the use of main switches on each car, which are actuated by the movement of a master controller by the motorman. This dispenses with the concentration of a large number of cables and contacts where arcs are likely to be frequent and heavy. The automatic feature of operation is of importance in securing a regular progressive action of the switches independently of the manner in which the motorman may handle the controller, or of any accident that may happen to the train line.

The control system is naturally divided into two general sections: the main motor control system through whose connections the current from the third rail is fed into the motors and back again into the track return, and the auxiliary control system through which, by means of any one of the master controllers which are placed at each end of every motor car, the motorman actuates the switches which make and break connections in the main motor control system.

The main motor control switches are opened and closed by compressed air. The action of the air is in turn controlled by electro-magnetic valves which are opened and closed by making and breaking the current in their exciting coils by means of the master controller. These valves are light and easily moved, and the auxiliary control system, therefore, operates with very light currents in a train line of seven small wires taking current from an independent storage battery of seven cells on each motor car.

The apparatus constituting the main control system comprises the following apparatus: Group of unit switches, resistances, electrically operated line switch and the supply system, comprising the third-rail shoes, supply mains and bus line, connecting the main control apparatus on all the cars, including the necessary fuses and jumpers.

The various details of the design have been carefully worked out to make the control as nearly as possible proof against the errors of the operator or against excess or failure of the main current supply. The connection of the control system with the air brake system lends itself readily to the introduction of features designed to automatically protect the train from accident.

There are four positions of the main controller handle, on either side of the central position. When at the central position, the current is off and the emergency brake is automatically applied. At the first notch in either direction from the center, the current is still off, but the brake is not applied. This is commonly called the "coasting" position. The second notch from the center is commonly called the switching position, because all of the extra resistance is then in series with the motors and control resistance enabling the car or train to be moved very gently while switching and coupling. The third notch brings the motors to the series position, ultimately working them up to half-speed, while the fourth and last notch is the full-speed or parallel position.

The acceleration resulting from the scheme of switch manipulation is very smooth, and the change from series to parallel is not perceptible.

The main control system includes the following apparatus: The switch group, consisting of 12 unit switches, each actuated by an independent air cylinder and controlling magnet valve, all of which are mounted in a common frame, an electrical interlock switch which produces the progressive action desired for automatic acceleration of the car, the air reservoir supplied with air at 70 pounds pressure from the control air reservoir, blow-out coils so connected into the main motor circuit as to carry all the current going to the two motors, giving the maximum blow-out effect for extinguishing the arcs, an overload trip at each end of the switch group actuated by the magnetic pull produced by the blow-out coil at each end, the main control resistance, the line switch, which is in series with all the apparatus in the main motor circuits and carries the entire current flowing to the switch group, an air-operated reverse switch and four third-rail shoes.

The auxiliary control comprises an electric circuit receiving its power from a small storage battery of seven cells. This circuit operates, by means of small electromagnets, the air valves which admit air to the cylinders whose pistons, when forced in and out, make and break the contacts of the main control system.

The auxiliary control system is in no way electrically connected with the main motor control system or any of the 600-volt wiring, and is absolutely independent of the main supply system. The apparatus in the control system is as follows: Master controller, line switch cut-out switch, brake cut-out switch, overload trip and reset device, train line, magnet valves and interlocks, line relay, limit switch, control cut-out switch and battery charging outfit.

The trailer cars are fitted with bus lines and their third-rail shoe connections for the main circuit, and also with the train line, including the necessary junction boxes and connector sockets for the auxiliary control circuit, these being necessary for connecting motor cars which are separated by a trailer.

There is one master controller at each end of every motor car. This is a very simple device consisting only of a movable drum carrying contact segments, the contacts being made with stationary fingers.

Alongside of each master controller, mounted within easy reach of the motorman, are the line switch cut-out, which, when open, makes it impossible for the third-rail current to reach any of the apparatus in the main control system, the brake cut-out switch, which, when closed in its normal position, permits the handle of the master controller when it reaches the central notch to complete a circuit which energizes the emergency train brake magnet valve, immediately releasing the air from the train pipe and setting the brakes, and an overload trip reset.

The train line, which comprises seven wires each having different colored coverings, is carried through the entire train by means of connector sockets and jumpers, and is also fitted with three junction boxes on each car, there being one at each end for the connections running to the master controller and the three auxiliary switches, also effecting a junction between the two train line connector sockets which are permanently fixed on opposite sides of the end sill of the vestibule. The third junction box is used to connect the train line with the battery and with the wires leading to the switch group, line switch, reverse switch and control cut-out.

The automatic progressive action of the unit switches is effected by the interlocks in connection with the limit switch which is mounted upon the switchboard panel fitted in the vestibule. The limit switch consists of a solenoid through which passes the entire current of one of the motors, and the magnetic action of this solenoid lifts a bridging piece from two contacts which are in series with the return circuit to the battery from the valve magnets of the switches.

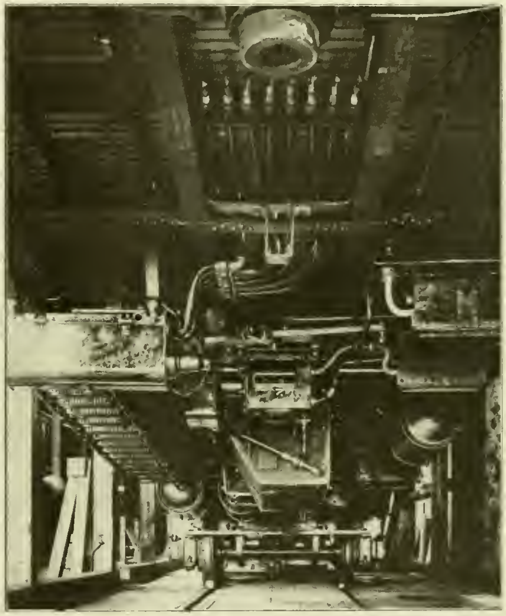
The line relay is a "no voltage" circuit breaker for the main circuit. Its action affects each car individually, so that if the current supply is interrupted on any car the switch group on that car will be cut out independently of the other cars in the train. If the current supply is restored after being broken, while the master controller is in one of the running positions, as for example when the car traverses a gap of the third rail that is longer than the distance between its third-rail shoes, the line relay will then lift and restore the battery connections to the switch group, which will then go through the prescribed cycle of operations under the control of the limit switch as above described, and again supply current to the motors, just as if the controller handle had been thrown to the off position and then turned on again. The line relay is mounted upon the switchboard panel at one end of the car.

The control cut-out switch is placed under one of the seats in the center of the car. It is designed to enable the motorman to cut out either or both of the motors under the car. It consists of a small drum-type controller with a permanently attached operating handle, which may be moved to four different positions.

From the description it will be seen that every precaution has been taken to place automatic safeguards about the operation of the entire car, as well as the individual pieces of apparatus, comprising its equipment. Too much current, or, on the other hand, none at all, will automatically bring the control apparatus to the off or coasting position, and a very slight movement of the master controller handle from the coasting position back to the center of the notch applies the brake instantly. The fact that the actuating current of the control is derived from the small battery, removes the risk of being obliged to depend on the state of the line potential for perfect action of the control. The interlocking switches controlling the successive application of the unit switches insure automatic acceleration and prevent as far as possible the abuse of the equipment from improper handling by the motorman. The control wires are at low potential, and danger from accident due to leakage is a minimum. The control can be inspected and tried at any time, whether line current is available or not.

Lighting.

The lighting of the car is divided into five independent circuits, for interior illumination, besides a separate circuit at each end controlling the vestibule dome lights and the signal markers. The incandescent headlight is in series with a resistance and independent of all other circuits. The headlight is controlled by a separate switch, but the marker and dome lights are so controlled that when the latter are turned out on either end of the car, the former are turned on. This is for the accommodation of the motorman, whose vestibule at night must be dark, except for the gauge lamp, while the headlight and markers are to be lit only at his end of the car.



Electric Car Equipment of the Long Island Railroad.—Wiring and Fixtures Underneath the Car.

The interior of each car is lighted by twenty-six 16-candle-power incandescent lamps. Two such lamps are placed in each vestibule. One lamp is located in each marker, and a 50 candle-power lamp is placed in the headlights which are permanently fixed on the vestibule roof between the markers. Snap switches are placed within easy reach of the motorman for the control of the headlight, the markers and the platform lights. All other light and heater switches and fuses are located on the switchboard.

Heaters.

There are 24 electric heaters in the body of the car, and at each end there is one of a special type in the motorman's cab. The heaters inside of the body of the car are proportioned so that each can safely radiate the heat generated by 600 watts. The heaters in the steel motor cars were supplied by the Consolidated Car Heating Company. Those in the wooden trailer cars were manufactured by the Gold Car Heating & Lighting Company, and are of the truss plank type of construction. The internal arrangement of the latter consists of a special resistance wire wound as a helix and supported on a crimped and enamelled steel rod. There are two elements, as in the case of the motor car heaters. The heating circuits are controlled by quick-break knife switches mounted at the top of the switchboard panel at the end of the car.

Wiring.

All wires and cables, for whatever purpose, are run in iron conduit. The sizes of wire used in the car wiring were No. 12 and No. 14 for the auxiliary control, and No. 0, No. 00, 144,000 circular mils and 250,000 circular mils for the main motor control circuit. These various sizes of conductor are all made up in standard cables.

In the vestibule at the motor end of the car is mounted the switchboard. A compartment is provided in the end bulkhead with a metal door lined with asbestos material, which when opened, exposes the entire front of the switchboard panel. The panel is supported by a steel frame. The conduits are of the "loricated" type, and are run through the framing of the car according to a well worked-out plan which is uniform for all cars, the framing being drilled at the proper points before the cars left the builders' shops.

The weight of a steel motor car and its equipment is 82,138 pounds and the maximum passenger load is estimated at 16,000 pounds, making a total of 98,138 pounds.

Auxiliary Equipment.

The steel cars as thus constructed and equipped have now been in successful operation for over a year.

Besides the steel cars just described, 55 wooden trailer cars, which were built six or seven years previously with a view to using them in electrical trains, were equipped to run in trains with the motor cars; provisions had been made in designing these car bodies for conveniently disposing the electric lighting circuits, but the class of work then in use is not considered safe now. These trailers are 46 feet long and 8½ feet wide over all. These wooden trailers had formerly been used in certain Long Island Railroad trains that had been run on the Brooklyn Elevated lines between Flatbush avenue station and the Brooklyn Bridge.

Five electric express cars were provided, equipped with the standard type of motor and trailer trucks, two 200-horsepower standard motors, and with the standard multiple-unit control apparatus. These cars are built of wood, 52 feet 5 inches over all in length, 9 feet 9½ inches in width, and with roof 12 feet 6¾ inches above the top of the rails. They are equipped with standard M. C. B. couplers, and haul the old standard steam baggage and express cars as trailers.

Two all-steel portable substation cars, which were designed to carry a complete rotary converter substation of 1,000 kilowatt capacity, are so fitted that they can be used at a number of different places on the system on the Long Island Railroad where connections to the high and low tension systems of distribution can readily be effected. These portable substation cars are 38 feet 4 inches long over all, 9 feet 10 inches wide, and 12 feet 9 3-16 inches high above the top of the rail. They are built entirely of steel. The weight of the equipment carried is 142,000 pounds. The weight of the car without equipment is 49,000 pounds. The car is carried on a freight truck of the standard type and is not equipped with motors, but is hauled from one place to another. Its superstructure is so constructed as to be readily taken apart in order to enable the machine to be run into a substation and be placed underneath the traveling crane in case it is necessary to repair the apparatus. These cars were primarily intended to be used at the racetracks during the racing season when the loads are particularly heavy, but have also been found quite useful at other points since operation began.

Electric Car Equipment of the Long Island Railroad.—Exterior of Inspection Shed at Dunton.

A rotary snow plow has also been provided, built by the Peckham Manufacturing Company, and equipped with one motor and one trailer truck of standard type, and all of the standard motor car electrical equipment. A set of revolving blades with fan and housing is mounted at each end of the car, operated by one line shafting running through the car and fitted with two friction clutches, one for each end section, the center section carrying two 50-horsepower railway type motors, run by a series parallel controller of the standard platform type.

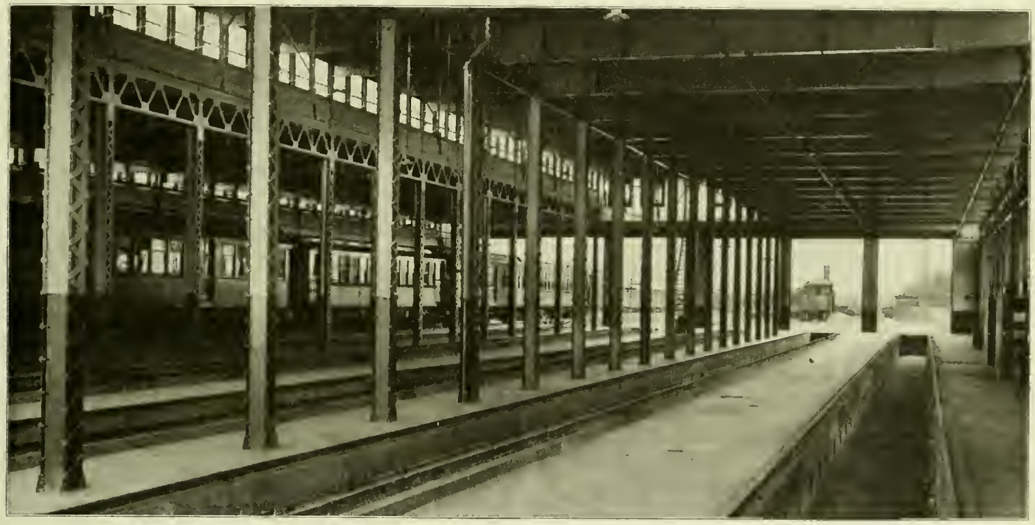
Car Shops.

The facilities for inspection and repair of electric cars of the Long Island Railroad system consist partly of a section of the original car shop at Morris Park, near Jamaica, which has been to a certain extent remodeled to better accommodate the new motive power, and two inspection sheds, one located at Rockaway Park, at the extremity of the Rockaway Beach Division, the other being at Dunton, which is between Morris Park and Jamaica, on the Atlantic Division. The two latter structures are entirely new and are fitted only for the inspection of trains, while the car shops at Morris Park are fitted with the necessary machine tools for executing repair work.

At Morris Park a new shop was built paralleling the old car shop, and with a transfer table situated between them. It is 216 feet long by 110 feet wide and is connected with the mill that runs across the end of the old shop by a two-story structure containing space for pattern, upholstery and brass-finishing shops. The walls of the shop are built of brick and the roof is made in the saw-toothed form so commonly used for this purpose. There are thirteen pit tracks 16 feet apart between centers. The shop is wide enough to accommodate two 51-foot cars with a space between the ends of the cars, and three feet between the ends of the cars and the walls. The pits are about 26 inches deep below the top of the rail. The transfer table is 75 feet wide, and long enough to accommodate the largest type of Pullman coach. The transfer table is operated electrically, and is provided with an electric capstan to assist in moving cars and trucks out of the shop.

Inspection Sheds.

Besides the repair shop facilities at Morris Park, two inspection sheds have also been provided for effecting the periodical inspection and light repairs that are required to keep the cars in fit operative condition. The smaller of the inspection sheds is adjacent to the Rockaway Park terminal. The larger inspection shed is located at Dunton on the Jamaica Division directly west of Jamaica. This building is about double the size of the former, being designed to afford inspection facilities for all the cars on the Atlantic Division, which is a busy line all the year round. The building is constructed entirely of reinforced concrete, with roof trusses of steel plate girders supported in the center of the building on lattice columns. The building consists of one central and two side sections, the central section extending above this, forming a broad clerestory with wide windows. The building is 242 feet 8 inches in length over all and 94 feet in extreme width. The steel girders and columns are placed in bents 12 feet apart; the roof of the side sections of the building slopes toward the center, while the roof over the central section is pitched slightly toward either side. The roofing over the whole building is composed of 5¼-inch reinforced concrete slab, covered with five-ply pitch felt and gravel roofing. The gutters along the eaves of the clerestory are of 16-ounce copper, while the counter-flashing between the roof and the side sections of the parapet, which runs completely around the building, is of 14-ounce copper, tacked to a 2x4-inch wooden strip. The plate girders of the side sections are 3 feet 8 inches in depth at their outer ends, and about 2 feet 4 inches in depth where they rest upon the columns for supporting the clerestory. The six tracks run completely through the building, the doorways being fitted with rolling steel doors. The door lintels are each of two 10-inch I-beams.



Electric Car Equipment of the Long Island Railroad.—Interior of Inspection Shed at Dunton.

The tracks are all provided with pits three feet in depth below the base of the rails, which set about 4½ inches above the floor level upon 12x12 inch wooden stringers. Photographic illustrations of the exterior and of the interior of this building are here presented.

The Rockaway Park inspection shed will accommodate 12 cars, and that at Dunton 24. The latter station is provided with room for an office upon a gallery running across one end of the building, reached by an iron staircase coming up between the tracks.

The Dunton inspection shed was built on rather uneven ground and at one end of it is provided a heating plant, set in a basement which is finished off under one corner of the structure, covering an area of about 34x37x35 feet. The nature of the ground enabled the construction of this basement without the necessity of excavating, and provided a very convenient location for the heating plant and fuel. Coal can be dumped into this basement through suitable openings placed between the tracks directly over it.

Organization.

The equipment of the steel passenger cars, the auxiliary rolling stock, and the building of inspection sheds, were carried out by Westinghouse Church Kerr & Co., who, as in the other portions of the complete equipment, acted as constructing engineers.

The entire work of design and construction was in charge of Mr. George Gibbs, chief engineer of electric traction of the Long Island Railroad.

Conclusion.

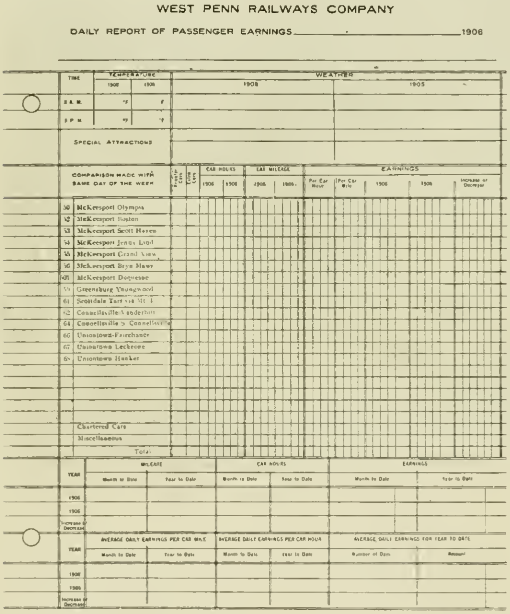
The car equipment has proved itself in every way equal to the demands made upon it both for regular and emergency conditions of travel. The electro-pneumatic multiple-unit control system has worked perfectly from the start, and throughout the entire installation, including the power station, transmission system, substations and cars, the endeavor was made not only to take advantage of the most recent progress, but, as opportunity offered, to establish new precedents in the art. In achieving the distinction of being the first one of the main steam railroad lines to initiate and make effective the change of motive power for its suburban service to meet the needs of its territory, the Long Island Railroad Company has set an example of foresight, thoroughness and sufficiency in the execution of the undertaking.

But the record will be incomplete without an acknowledgment of the credit due to the late Mr. William H. Baldwin, Jr., president of the Long Island Railroad from 1896 to 1905, whose foresight, public spirit and initiative played such a leading part in the solution of a difficult rapid transit problem.

THE VALUE OF COMPARISONS IN THE TRANSPORTATION DEPARTMENT.

BY J. W. BROWN.

Just how much to spend in gathering statistics is a mooted question; too much money can be spent hunting up data but in many cases the error is on the other side, too little attention being paid to getting together concise, definite facts and figures which have a direct bearing on the work in hand. By the aid of proper forms there can be secured with little additional cost much of value in the way of comparisons.



WEST PENN RAILWAYS COMPANY

DAILY REPORT OF PASSENGER EARNINGS ________ 1906

Time	Temperature 1906	Temperature 1905	Weather 1906	Weather 1905
8 A. M.	°F	°F		
5 P. M.	°F	°F		
Special Attractions				

	Comparison made with same day of the week	Regular Cars	Extra Cars	Car Hours 1906	Car Hours 1905	Car Mileage 1906	Car Mileage 1905	Earnings Per Car Hour	Earnings Per Car Mile	Earnings 1906	Earnings 1905	Increase or Decrease
50	McKeesport Olympia											
52	McKeesport Boston											
53	McKeesport Scott Haven											
54	McKeesport Jenny Lind											
55	McKeesport Grand View											
56	McKeesport Bryn Mawr											
[illegible]	McKeesport Duquesne											
59	Greensburg Youngwood											
61	Scottdale Tarr via Mt. P.											
62	Connellsville Vanderbilt											
64	Connellsville S. Connellsville											
66	Uniontown-Fairchance											
67	Uniontown Leckrone											
68	Uniontown Hecker											
	Chartered Cars											
	Miscellaneous											
	Total											

Year	Mileage Month to Date	Mileage Year to Date	Car Hours Month to Date	Car Hours Year to Date	Earnings Month to Date	Earnings Year to Date
1906						
1905						
Increase or Decrease						

Year	Average Daily Earnings per Car Mile Month to Date	Average Daily Earnings per Car Mile Year to Date	Average Daily Earnings per Car Hour Month to Date	Average Daily Earnings per Car Hour Year to Date	Average Daily Earnings for Year to Date Number of Days	Average Daily Earnings for Year to Date Amount
1906						
1905						
Increase or Decrease						

West Penn Railways—Daily Report Blank for Passenger Earnings.

The daily comparative earning sheet of the West Penn Railways gives the following information:

Earnings of each individual route for the day.

Earnings of each individual route for the same day last year.

Earnings per car hour of each route as compared with same day last year.

Earnings per car mile as compared with same day last year.

Total earnings for the day as compared with same day last year—increase in black—decrease in red.

Total car hours and total mileage compared with same day last year.

Total receipts January 1 to date as compared with same period last year.

Total receipts from first of month to date also compared.

Average daily receipts January 1 to date compared with same period previous year.

Average receipts per car mile and per car hour during same periods.

Weather conditions and temperature records 8:00 a. m. and 5:00 p. m. as compared with same day last year.

Special attractions such as fairs, circuses, etc.

This entire data is readily entered on a sheet only 8 by 12 inches in size, and by means of carbons four copies are made at once.

To the transportation department this sheet furnishes much information that is valuable in determining car service on the various routes. On account of having three parks along its lines much extra service is operated and close attention must be given to the earnings of these extra cars that they do not run up a large mileage without commensurate receipts. Changes in schedule of regular cars are to a large extent determined by what is shown on the comparative earning sheet.

The comparison of earnings being of value it is equally true that a comparison of expenses will give much valuable information. Every 15 days an analysis of payrolls gives the costs for labor of motormen, conductors, inspectors, superintendents, dispatchers, etc., as compared with the same period last year. A moment's work with the pencil will determine whether the increased receipts are justifying the ever swelling payroll.

Much interesting information may be gained by the graphic method. Weekly receipts are plotted on co-ordinate paper, the curve covering the 52 weeks of the year. The same sheet is used for the ensuing year and thus comparison can be grasped by the eye at once for any period of the year.

Total operating expenses are plotted in the same manner and are also sub-divided in detail showing increases or decreases for each department.

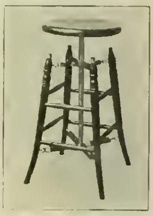
Travel curves are taken at intervals and are used in determining at what period of the day to increase or decrease car service.

Comparisons are of little value unless they are carefully kept up to date, but little work, however, is required to keep them up after the system is once established and undoubtedly the comparison, be it in figures or graphically depicted, is a great aid in the management of the transportation department.

A Spring Seat for Motormen.

The accompanying illustration shows a new stool for motormen which is fitted with a novel spring seat attachment. It will be noted that the legs are the same as those of the usual type of stool. The rod carrying the seat slides in two collars as shown, and may be adjusted to any desired height. To each of the collars are attached four steel springs which radiate to the four corners of the stool and are fastened to the legs.

The desirability of this form of stool will be readily apparent. By its use the motorman is relieved of the jar occasioned by travel over rough track, which is experienced with seats of the old type. The device was invented by P. J. Carlson, 302 Perry street, La Porte, Ind., who has applied for a patent on his invention.



Motorman's Stool with Spring Seat

SANSOM STREET SUBSTATION, PHILADELPHIA RAPID TRANSIT COMPANY.

The accompanying illustrations show the principal features of the recently completed substation of the Philadlphia Rapid Transit Company, which is located at Nos. 812-820 Sansom street. Some departures from the arrangement of the company's other substantions were made because of the shape of the lot available and the location in the closely built business district. The building is about 105 by 109 feet, and excepting the exterior walls, which are of brick, is of reinforced concrete. That the site was formerly occupied by the power house of the cable road, and is surrounded by higher buildings is the reason for two peculiarities in the building design—it was cheaper to fill the old basement than to remove the existing foundations, and accordingly the lowest floor of the substation is at the street level, instead of being a basement; to protect the contents of the building should the walls of surrounding buildings fall upon it the roof is made of reinforced concrete supported on beams of the same material 6 by 16 inches in sections spaced 5 feet 10 inches between centers. The windows are of wire glass mounted in sheet metal frames which are hung on trunnions and close by gravity; the chains which hold the windows when opened are all provided with fusible links so that in case of fire they will close automatically.

The reinforcement for the concrete work consists of round rods. Beams have longitudinal rods at the bottom only, unless they are continuous over columns, in which case one-half of the rods are bent to bring them near the top surface to meet the reverse flexure stresses. To take the longitudinal shear stirrups are placed in the beams, the spacing increasing with the distance from the columns. The floor sections are designed as beams with reinforcing rods near the lower surface.

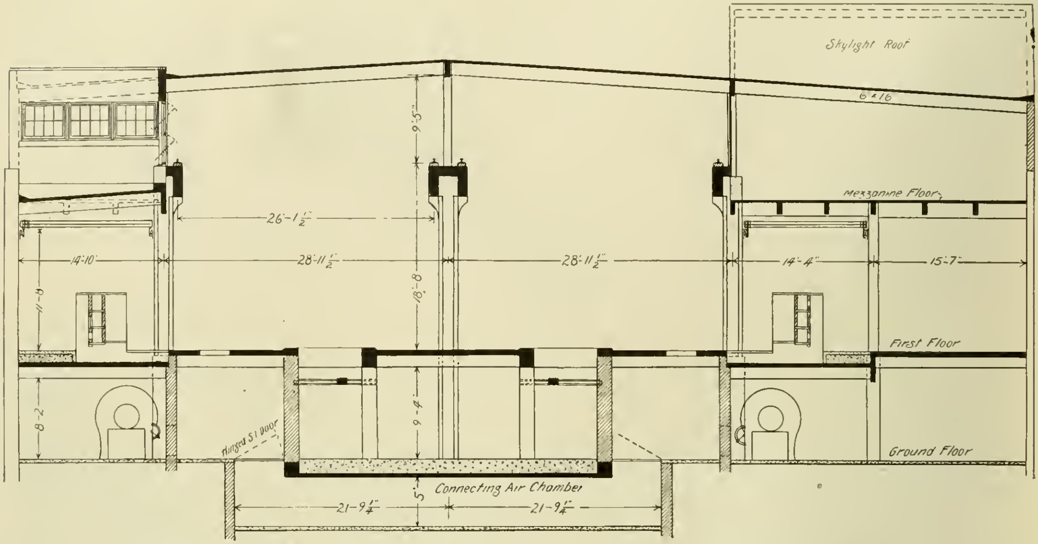
At the front end of the building there are two wide doors so that wagons may be driven inside, and as there is an opening in the rotary floor above this driveway, the cranes serving the rotary floor may be utilized in handling heavy machinery. On the ground floor are the blowers, air pressure compartments, heating plant and auxiliary storage batteries, and on the first floor the rotary converters, transformers, oil switches and busbar structures. On the mezzanine floor the switchboard gallery occupies a space the width of the building and 18 feet deep; to the east of the craneways for the rotary converter room is the cement testing laboratory, occupying a space 30 by 86 feet; on the west side in front are a storeroom and a toilet room, each about 15 by 16 feet, back of which the roof is at a lower level to permit of wall lighting on the west side of the building.

Work on the station was begun in September, 1905. The first rotary was started in the incomplete building on December 14, 1905, and the station was completed February 1, 1906.

The station is designed for eight 1,500-kilowatt rotary converters and other apparatus necessary for their operation. The equipment now installed comprises: Four 1,500-kilowatt Westinghouse shunt-wound rotary converters; four sets of three each of Westinghouse 550-kilowatt air blast transformers, 13,200-380 volts; three 90-inch fans built by the American Blower Company and direct connected to 17½-horsepower, 3-phase 25-cycle 400-volt Westinghouse induction motors, and designed to supply 20,000 cubic feet of air per minute at one ounce pressure; one motor generator set (150-horsepower, 380-volt, 3-phase induction motor and 100-kilowatt 625-volt direct current generator) with three 60-kilowatt, 13,200-380-volt transformers; one 2-kilowatt motor generator set (5-horsepower 600-volt direct-current motor and 110-volt direct-current motor) for charging the auxiliary storage batteries; and a Christensen D-4 air compressor for supplying the air blowing system. Each half of the station is served by a 25-ton Box 3-motor electric traveling crane. A trolley track is placed over each of the bus compartments with a one-ton Yale & Towne triplex hoist for handling the oil switches.

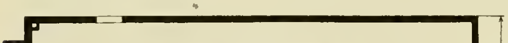
Sansom Street Substation, Philadelphia Rapid Transit Company—View of East Half of Station.

If this substation were cut along the center line of the rotary converter floor and the two halves placed end to end, and the switchboard located in front of the line of rotaries it would conform closely to the general design of the company's other substations, and in fact many of the details of construction are similar to those of the Glenside substation illustrated in the Review for September 15, 1905, page 542. Thus, the arrangement of compartments for the high-tension busbars. The sectionalizing switches, station transformers and oil switches is similar to that in the Glenside substation. The supports for cables, which in the ceiling are 1 by 3-inch channels hung from carriage bolts imbedded in the concrete, and on the walls are steel racks punched to receive adjustable malleable iron brackets, are also similar to those at Glenside.



Sansom Street Substation, Philadelphia Rapid Transit Company—Cross Section of Building.

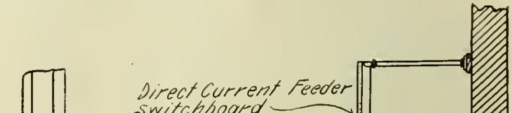
The station is supplied with alternating current at 13,000 volts, 3-phase, 25 cycles, by means of three conductor cables laid underground from the generating plant at Second street and Wyoming avenue and Beach and Laurel streets; these alternating-current feeders enter at the Sansom street front of the building.



Sansom Street Substation, Philadelphia Rapid Transit Company—Plan of First Floor.

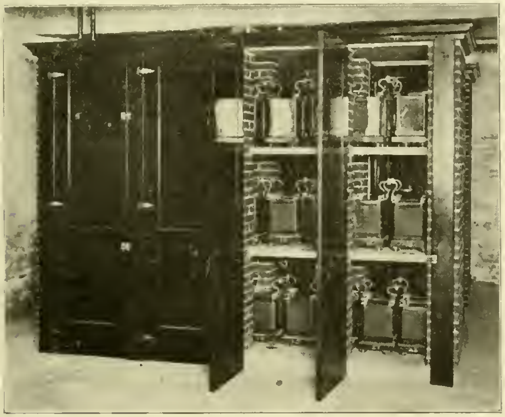
The wiring plan for the station was very carefully drawn and conduits (for the most part of 1¼-inch pipe) were laid in the concrete floors for the station wiring, excepting the main cables from the rotary transformers to the converters.

The cross section of the station shows the arrangement of blower compartments and pressure chambers, and the tunnel connecting the pressure chambers on the two sides of the station. The air-blast fan motors are connected so that any motor or any set of motors may be connected to the

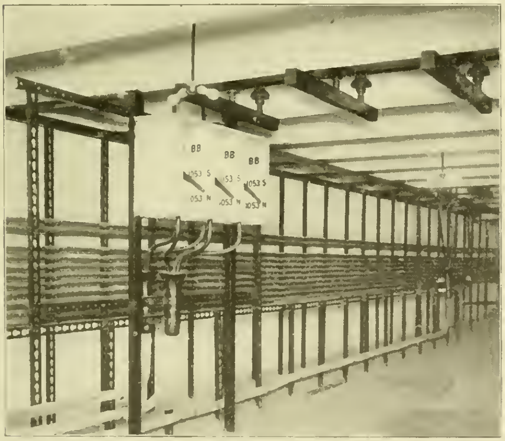

Direct Current Feeder Switchboard
4'-6"
Connections between Switchboards
11'-10"
Machine and Station Auxiliaries Switchboard
9'-0
Slate Panels
Outgoing Railway Feeders

Sansom Street Substation, Philadelphia Rapid Transit Company—Section Through Mezzanine Floor Showing Switchboard and Stairways.

low-tension side of any set of transformers supplying the rotary converters or to the motor-generator transformers. Three-pole, double-throw switches with the upper terminals connected to the motor-generator transformers and the four sets of rotary-converter transformers, respectively, and each middle terminal connected on the board to the lower terminal of the adjacent switch, permit the fan motor circuit to be connected through the switch blades and board wiring, to any set of transformers, and the arrangement is such that by no possibility can two sets of transformers be connected. A switchboard of this description is placed in each half of the station with ties connecting the lower terminal of the last switch on each to the middle terminal of the first switch on the other, so that both fan motor circuits may be connected to any set of transformer circuits on either board.



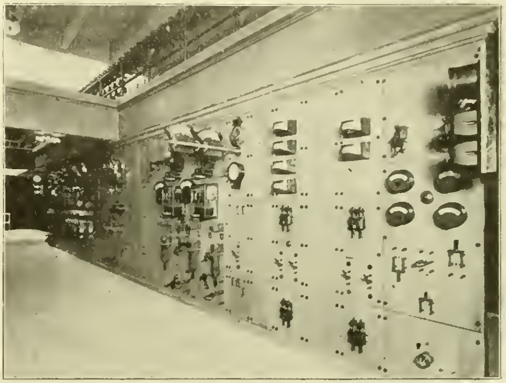
Sansom Street Substation, Philadelphia Rapid Transit Company—Storage Battery Compartments.



Sansom Street Substation, Philadelphia Rapid Transit Company—View in Basement Showing High-Tension Feeder Cables and Disconnecting Switches for Tie Lines to Another Substation.

The transformers are connected in delta and in forming the delta on the low-tension side the necessity of splicing large cables is entirely obviated, by the use of special clamps attached to the transformer terminals and of two cables to the rotary for each phase. The clamps are designed to receive two cables, and one being attached to each transformer terminal there are 12 cables to provide for instead of six, and these are arranged as in the accompanying diagram.

The switchboard is at the south end of the station and is in two stories. The upper board, which is on a gallery at the level of the mezzanine floor, consists of 50 panels of Tennessee marble; each panel is designed for receiving two feeders of 1,000 amperes capacity, and has mounted on it a 2,000-ampere circuit breaker, a 2,000-ampere double-throw switch for making connection to either of the two busbars, and two 1,000-ampere single-throw switches, through which connection with the individual feeders is made.



Sansom Street Substation, Philadelphia Rapid Transit Company—Machine Switchboard on First Floor with Feeder Board Above.

Sansom Street Substation, Philadelphia Rapid Transit Company—Basement Floor Showing Reinforced Concrete Piers.

The lower switchboard, on the rotary converter floor, is 42 feet long and with a single exception is symmetrical about the center panel. Beginning at the left end there are:

One panel for station lights.

Two panels for alternating current feeders, each of which receives two No. 000 feeders.

Two alternating current panels, each of which supplies two rotary converters.

One panel for the motor-generator set.

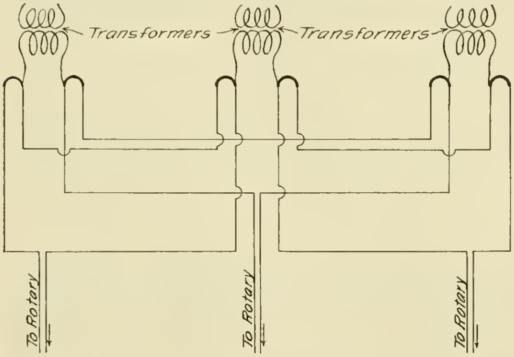
Four direct current panels, each for one rotary converter.

One panel for a double starting set, by means of which a rotary converter may be started from the direct current busbars, or from the motor generator set, using either set of starting resistances or circuit breakers. This panel is the center of the board and on the right of it are nine panels corresponding to those enumerated for the left side of the board, but taken in reverse order.

The last panel, which corresponds to the lighting panel, is equipped for control of the two auxiliary storage batteries and the two-kilowatt charging set. On the rear of this panel are provided a number of three-way switches by which the basement incandescent lamp circuits may be thrown to the positive side of the batteries instead of to ground, and the batteries charged in this way instead of by the motor-generator.

The Philadelphia Rapid Transit Company does its own switchboard construction.

Reference to the cross sections of the switchboards will make clear the arrangement of the conduits in the floor in which are laid the connections between the upper and lower boards, and through which the direct feeders are led from the upper board. These conduits are covered with slabs of slate 2 inches thick. Between the gallery floor and the main floor the feeder cables are mounted on the wall of the building and are covered in front with slate panels, an arrangement which is neater and cheaper than to place the cables on the wall without covering; being concealed the work may he less carefully finished and the saving in cost here is greater than the expenditure for the slate coverings.



Sansom Street Substation, Philadelphia Rapid Transit Company—Diagram of Delta Connections Without Splices.

The resistances for the starting rheostats are mounted on a bridge suspended from the ceiling of the ground story, immediately under the switchboards.

The storage batteries, of which there are two, for operating the oil switches, each comprises 56 cells of the Electric Storage Battery Company's Type E seven-plate chloride accumulator, and are in acid-proof compartments in the basement. The battery compartments are three shelves high with slate slabs supported on brick piers and end walls, the sides being closed by wooden doors. A branch from the compressed air piping system is introduced at one end at the bottom and a 4-inch terra cotta duct at the top provides an outlet so that a constant circulation of air through the compartment is assured.

Including the Sansom street substation, the company has now in operation a total of 20,000-kilowatts in rotary converters, which soon will be increased to 31,000-kilowatts. The ultimate capacity for which the 10 substations (seven in operation, two now building and one to be built) are designed is 63,500-kilowatts in rotary converters. The substations in detail are:

No. 12 (at 123 Chelten avenue) has two 500-kilowatt General Electric and two 1,000-kilowatt Westinghouse machines. There is no room for other units and one 1,000-kilowatt rotary will be taken to the Willow Grove station (No. 8) and a 1,500-kilowatt rotary installed in its stead at Chelten avenue, making the capacity there 3,500-kilowatts.

No. 16 (Frankford avenue and Arrott street) has two 500-kilowatt General Electric and one 1,000-kilowatt Westinghouse rotaries with room for a second 1,000-kilowatt machine.

No. 17 (13th and Snyder streets) has two 500-kilowatt General Electric and two 1,000-kilowatt Westinghouse rotaries, with room for two more 1,000-kilowatt machines.

No. 18 (52d and Lancaster streets) has three 1,000-kilowatt Westinghouse rotaries with room for one more of the same size. The building has a temporary end to facilitate extension and to give room for a total of six rotaries in the station.

No. 19 (Glenside) has two 500-kilowatt and one 1,000-kilowatt Westinghouse rotaries with room for one more. This station has a temporary end, the site permitting extension to accommodate two more 1,000-kilowatt machines.

No. 8 (Willow Grove) has two 500-kilowatt Westinghouse rotaries and space for a 1,000-kilowatt machine. This will be removed here from Chelten avenue.

Sansom street substation has capacity for eight 1,500-kilowatt machines; four 1,500-kilowatt Westinghouse rotaries are now installed.

The substation at 56th and Market streets, which is now ready to receive machinery, will have an initial equipment of two 1,500-kilowatt rotaries, with a capacity for a total of six 1,500-kilowatt machines.

The substation at 58th street and Woodland avenue, which is now building, will have an initial equipment of two 1,500-kilowatt rotaries and capacity for four more of the same size.

Plans for a substation to be located at Kensington avenue and Cumberland street are now in preparation. This station is designed for six 1,500-kilowatt rotaries, three of which will be installed at first.

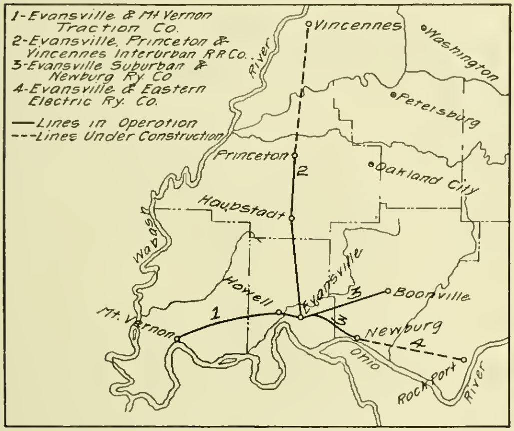
LOW CASUALTY RECORD ON THE BROOKLYN RAPID TRANSIT SYSTEM.

In a report to the state board of the railroad commissioners Mr. J. F. Calderwood, vice-president and general manager of the Brooklyn Rapid Transit Company, recently made public the fact that the casualities for the past year on that extensive surface and elevated system were surprisingly small. There were 111 accidents resulting in death, of which number but 13 were passengers. During the year ending June 30, 1906, this company handled 452,604,203 passengers. Of the total of 111 fatalities, no liability on the part of the company existed in 76 cases. Two-thirds of the accidents happened on the surface lines and one-third on the elevated system. The accidents on the elevated system occurred chiefly near Coney Island where the tracks are on a private surface right of way, and they were frequently the result of trespassing on the part of loafers and intoxicated persons.

The good record of the company has been largely due to the policy of general improvement which began in 1902. Open cars are gradually being replaced by cars of the modern semi-convertible type, embodying a number of important improvements designed by the Brooklyn Rapid Transit Company. The cars are equipped with an improved fender of the folding type which can be conveniently raised by the motorman without leaving the platform. The open car running board is, of course, eliminated and the new cars are provided with low steps. Finally, they are equipped with an efficient air brake system. These improvements, correcting fruitful sources of accident, are in a large part responsible for the low fatality record. The objection to the semi-convertible car has been the conviction that it could not be loaded and unloaded as quickly as the open car, and therefore was less suitable for handling the large emergency crowds which companies are called upon to carry in summer. Heretofore this has been the opinion of the Brooklyn Rapid Transit Company, but in a recent test made by this company at Coney Island, it was found that there was practically no difference in the time required for loading the two types of car. This was largely due to the confusion resulting from the invariable scramble for the best seats on open cars.

THE EVANSVILLE & MT. VERNON ELECTRIC RAILWAY.

The city of Evansville in southwestern Indiana is becoming an interurban center of considerable importance. At the present time three interurban lines have their terminals in this city, including the Evansville Princeton & Vincennes Interurban Railroad, which was recently incorporated and purchased the Evansville & Princeton Traction Company, the Evansville Suburban & Newburgh Railway, which operates between Evansville and Boonville and Evansville and Newburgh, and the Evansville & Mt. Vernon Electric Railway. Of these three lines the latter has most recently been put in active operation. This railway is 20 miles long and connects Evansville with Mt. Vernon, passing through a prosperous and well-settled farming district.


1-Evansville & Mt Vernon Traction Co.
2-Evansville, Princeton & Vincennes Interurban RR Co.
3-Evansville Suburban & Newburg Ry. Co
4-Evansville & Eastern Electric Ry. Co.
—Lines in Operation
---Lines Under Construction
Vincennes
Washington
Petersburg
River
Princeton
2
Oakland City
Haubstadt
Wabash
Evansville
Howell
3
Boonville
Mt. Vernon
1
Newburg
4
Ohio
Rock Port
River

Evansville & Mt. Vernon Interurban—Map of Route and Connections.

Construction work was started in August, 1905, and the first car operated on June 18, 1906. For 16 miles between the terminal cities the company operates over a private right of way from 33 to 60 feet wide. In Mt. Vernon the cars traverse the public streets for a distance of one mile and in Evansville the interurban company has an agreement with the Evansville Electric Railway Company by which the cars are operated over the tracks of the city line for three miles.

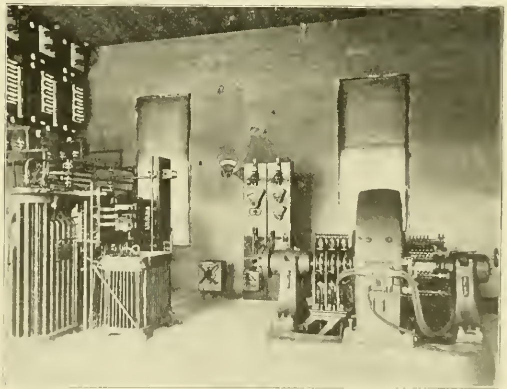
The roadbed of that portion of the line outside the cities is of standard construction and a maximum grade of two per cent is maintained. The right of way extends through a comparatively level section and no difficult engineering features were encountered. For a considerable portion of its length the electric line parallels the steam road of the Louisville & Nashville Railway with which it has a grade crossing at a point about 10 miles from Evansville. The track is laid with 70-pound T-rail resting on 6x8-inch x 8-foot oak ties. The joints are bonded with 8-inch soldered bonds of No. 0000 section.

The overhead construction is of the bracket type. Two No. 000 trolley wires are attached to the 9-foot tubular iron brackets by twin straight-line hangers and 15-inch clinch ears. Provision is made for installing a telephone system, although at present all cars have positive meeting points and a dispatching system is found unnecessary.

Current for the operation of the line is obtained from the Evansville Gas & Electric Company which has installed a 500-kilowatt Curtis steam turbine in its power house to care for the railway load. This company is also installing a 1,500-kilowatt turbine of the same make to provide for the further demand which will be made upon its current supply by other interurban properties centering in Evansville.

Evansville & Mt. Vernon Interurban—Concrete Substation at Ford.

Current is transmitted from the power house, which is located near the center of Evansville, to the railway company's substation at Ford, located about midway between Evansville and Mt. Vernon, through a high-tension line of three No. 4 copper cables. In order to avoid passing through the Evansville fire limits it was necessary to lead the high-tension lines from the power house to the company's right of way by an indirect route of about three miles. The current is transmitted at a pressure of 13,200 volts and is delivered to the substation without any noticeable drop in pressure. The transmission line is carried on 45 and 50-foot poles within the city and on 40-foot cypress poles on the private right of way. The poles are located 100 feet apart and are set 6 feet



Evansville & Mt. Vernon Interurban—Interior of Substation at Ford.

in the ground. Each pole is provided with a breast-block and a key to aid in keeping it in a normal position.

The substation at Ford, which is shown in the accompanying illustration, is of concrete construction and the roof, which is also of concrete, is reinforced with several lengths of steel rails. The building is 30 x 29 feet in floor area, 27 feet in height at the front and 25 feet in height at the rear. The equipment is of General Electric manufacture and consists of a 300-kilowatt, 600-volt rotary converter, three step-down transformers, oil switches, switchboard and other necessary fittings.

The method of leading the high-tension line into the substation is interesting. The cables are carried from the pole line to a 40-foot strain pole at the west end of the building. This strain pole is strongly guyed and is provided with four sets of cross-arms which serve as a terminal rack. The high-tension wires are attached to the highest cross-arm and are dropped to the lowest arm which stands opposite a waterproof hood 4x6 feet in size, fastened to the wall of the substation. The bottom of this hood consists of a marble slab ⅞ inch thick, provided with openings in which are placed porcelain wall insulators. The transmission wires pass from the strain pole through these insulators and thence through insulated openings in the main wall of the substation to the disconnecting switches. By this method of introducing the cables into the building the danger of a short circuit at the point of entering is reduced and there is less liability of moisture following the wires.

The car house, shops and offices of the company will be built some time during the coming year and will be located on ground adjoining the substation. Until the shops are completed heavy repairs on the interurban equipment will be made at the plant of the Evansville Electric Railway Company.

The rolling stock equipment consists of three 43-foot, two-compartment passenger cars and one 45-foot express car. Each car is provided with four G. E.-57 motors, K.-14 controllers and Christensen air brakes. The cars were furnished by the St. Louis Car Company.

At present a two-hour schedule is maintained between Evansville and Mt. Vernon. This will shortly be increased to a 60-minute headway. As a result of the opening of the interurban line the Louisville & Nashville Railway, which it parallels and which also connects Evansville and Mt. Vernon, has put in operation an interurban train consisting of an engine and one passenger coach between the two cities. A two-hour schedule has been maintained by this train and the rate of fare between Evansville and Mt. Vernon has been reduced to 35 cents one way or 65 cents for the round trip. The Evansville & Mt. Vernon Electric Railway has fixed a rate of 40 cents one way and 70 cents for the round trip between the two cities and enjoys a good patronage.

The officers of the Evansville & Mt. Vernon Electric Railway Company are: W. M. Ford, president; John Funke, vice-president; F. W. Reitz, secretary-treasurer; W. L. Sonntag, manager, and A. C. Hawkins, superintendent.

PHILADELPHIA RAPID TRANSIT SHOPS AT SIXTY NINTH AND MARKET STREETS.

In the Review for September 15, 1905, page 526, brief reference was made to the plans of the Philadelphia Rapid Transit Company for building shops at its Sixty ninth and Market streets terminal for the inspection and repair of the elevated railway equipment. The accompanying illustrations show the general plans of the buildings which are now approaching completion.

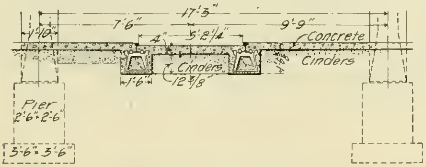
The buildings provide for an inspection shop 224 feet by 86 feet 3 inches, with four pit tracks extending the entire length of the building; two repair shops, No. 1 being 224 feet by 86 feet 3 inches located parallel to the inspection shop and 34 feet 6 inches from it (this shop has five pits), and No. 2 which is 112 feet by 86 feet 3 inches; a jacking-up shop 120 feet 9 inches by 118 feet; a truck repair shop 48 feet by 36 feet 3 inches, and a machine shop 80 feet by 86 feet 3 inches. Between shops No. 1 and No. 2 and the jacking-up shop is a 45-foot transfer table; a smaller transfer table is provided between the jacking-up and the truck repair shops. The 34½-foot space between the inspection and No. 1 shops is to be served by a traveling crane.

The buildings have walls of brick and reinforced concrete roofs supported on a steel framework; large skylight areas and window areas are provided.

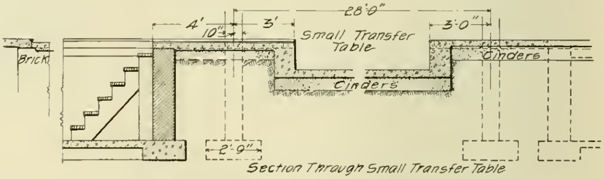
The grade of the eastern portion of the site being low, the pit floors in the inspection and No. 1 shops are some distance above the ground and are of reinforced concrete supported on the column piers, as shown in the sectional drawings.

The pits in the jacking-up shop and inspection shop are closed at the sides, that is, the rails are supported on longitudinal solid brick walls. In the No. 1 and No. 2 shops the pits are open, the shop floor at the rail level being supported on transverse brick walls. The details of these sections are shown in the drawings.

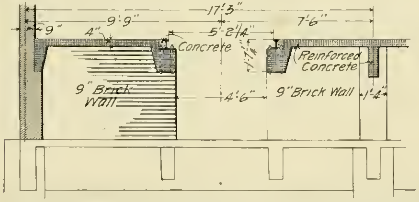
The machine shop equipment decided upon comprises: One 42-inch wheel lathe, 10-feet centers; one 300-ton wheel press; one 42-inch boring mill; one 38-inch by 8-feet lathe with 36-inch Cushman chuck; one 24-inch by 6-feet lathe with 18-inch Cushman chuck; one 12-inch by 3-feet lathe; one



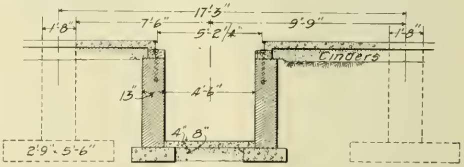
Cross Section-Jacking Up Shop



Section Through Small Transfer Table



Cross Section Through Pit-Shop No 1

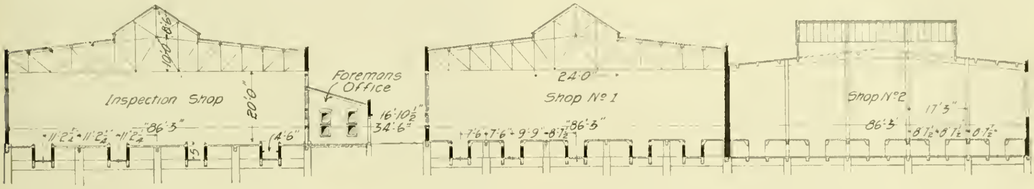


Cross Section Through Pit-Jacking Up Shop

New Shops, Philadelphia Rapid Transit Company—Details of Floor in Shops and Substructure for Small Transfer Table.

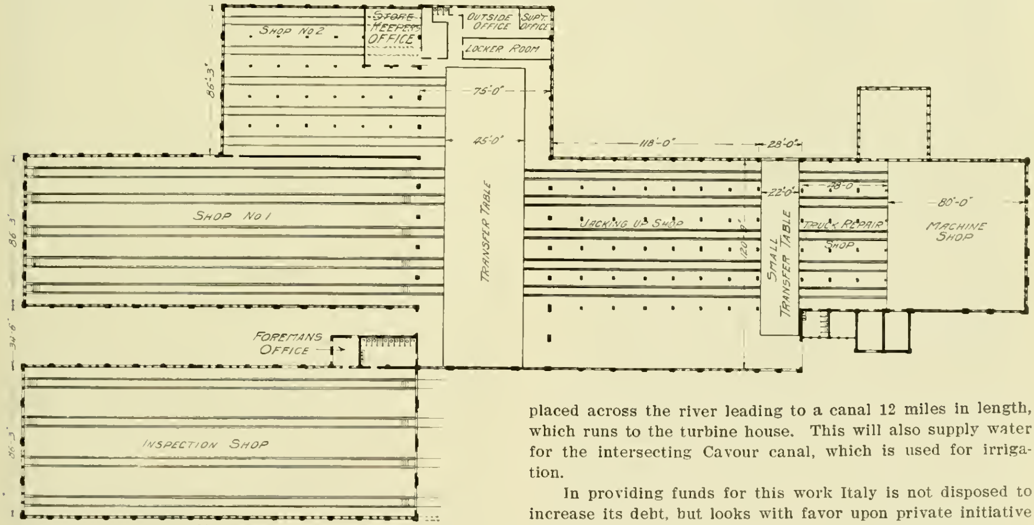
traveling head shaper; one bolt cutter, and one small drill, all of the Bement-Mills manufacture; one Bickford radial drill press; one Diamond 24-inch water emery wheel; one 16-inch double-end emery wheel made by the Northern Electric Manufacturing Company, Madison, Wis. These tools will be driven by 220-volt variable speed motors made by the Electro Dynamic Company.

The machine shop is to be served by a 15-ton, 3-motor electric traveling crane of 58 feet 4½ inches span. In the jacking-up shop there are to be ten 12-ton car-body cranes of 15 feet 3 inches span, 120 feet runway and 16 feet 6 inches lift; two of these cranes will be over each pit track for use in lifting car bodies from trucks. The cranes will all be furnished by Alfred Box & Company, Philadelphia.



New Shops, Philadelphia Rapid Transit Company—Section Through Inspection, No. 1 and No. 2 Shops.

The company has plans for a small direct-current power station to be located about midway between the terminal passenger station at Sixty-ninth and Market streets and the new shops, and connected with both by a tunnel in which will be carried pipes for exhaust heating on the Warren-Webster vacuum system, electric wires, compressed air mains, etc. The equipment will include four 250-horsepower Babcock & Wilcox boilers, hand fired, designed for 125 to 150 pounds steam pressure; two 14 and 24 by 24-inch Fitchburg tandem compound engines; generators for supplying 220-volt current for shop motors and 110-volt current for lighting; fire service pumps and two stage air compressors of capacity for 250 cubic feet of free air per minute.



New Shops, Philadelphia Rapid Transit Company—Ground Plan of Buildings.

A full regiment of the Massachusetts militia was recently carried over the Boston & Worcester line to Musterfield.

ELECTRIC RAILWAY PROGRESS IN ITALY.

Experience with electric railways in Italy has been so favorable that it is now proposed to make a more extended use of this source of power and instead of replacing the old rolling stock with new locomotives in some regions, the lines will be operated by electricity. During the past three years 260 miles of real electric railways have been operated in Italy—the Milan-Gallarate-Varese line, 80 miles, which is operated by the third rail, and the Valtellina with 65 miles of electric line using overhead conductors. For the Milan system the water-power is obtained from the River Adda, where for three miles from Desco there is a difference of level of 98 feet and 10,000 horse-power is available. It is now proposed to convert to electric operation the Italian lines which enter at Novara in the northern part of the country and the minister of public works has been instructed to construct a hydraulic plant for generating electric power. In this work the water of the Lessin will be utilized and about 7,500 kilowatts will be obtained from this source. A large dam will be placed across the river leading to a canal 12 miles in length, which runs to the turbine house. This will also supply water for the intersecting Cavour canal, which is used for irrigation.

In providing funds for this work Italy is not disposed to increase its debt, but looks with favor upon private initiative and is willing to grant subventions or subsidies based upon the mileage built and operated. These government subventions are regarded as safe and accepted by the Italian banks as good security.

As a field for the investment of foreign capital, the conversion of electric operation of railroads in Italy would appear to offer greater inducements than in Mexico. The opportunity for the development of traffic, on account of the increasing number of tourists who invade the country each year and the growing prosperity of the people themselves, is greater and the high character and great ability of the ministry of finance which is now directing the railroad programme should be more assuring.

SWITCH AND TRANSFORMER HOUSE FOR BRUNOTS ISLAND POWER STATION, PITTSBURG RAILWAYS COMPANY.

The location of the Brunots Island power station of the Pittsburg (Pa.) Railways Company is unique. The buildings stand on a large island in the Ohio river which location is approximately the center of electrical distribution for the railway and lighting properties in Pittsburg and its suburbs. This power plant was described and illustrated in The Street Railway Review for July, 1905, page 401.

The present equipment of the station consists of two 1,500 kilowatt capacity, two-phase, revolving-field, 60-cycle, 2,200-volt Westinghouse generators driven at 90 revolutions per minute by Rice & Sargeant cross-compound condensing engines, and three 1,500 kilowatt capacity, 600-volt, direct-current Westinghouse generators driven by engines similar to those for the alternating-current units. Additional machinery which will greatly increase the capacity of the plant has been ordered. The new equipment will consist of three Westinghouse-Parsons turbine units of 7,500 horsepower capacity each and a similar unit of 5,000 horsepower capacity. These units will generate three-phase, 60-cycle current at 14,000 volts pressure.

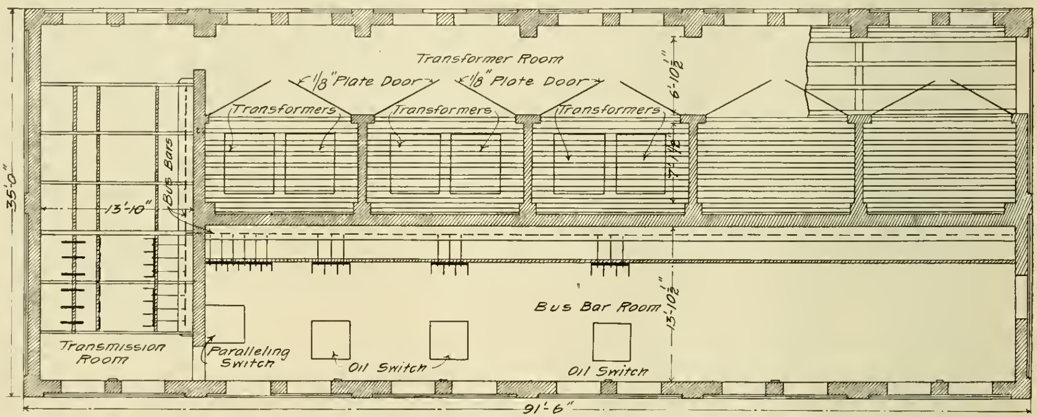
At the time of installation of the original equipment it was most feasible to generate current at 2,200 volts and carry it by means of several large cables from the island on which the power station stands to the south shore of the river where there was installed a switching station for controlling the distribution circuits feeding the various lighting and railway substations. Since that time, however, the use of current at higher pressures and to greater distances has so developed that it is now most feasible to distribute the alternating-current output of the station at 14,000 volts pressure and in order to raise the potential at which the current is generated to the distribution pressure, a transformer and switch house has recently been built. This transformer house now serves the purpose of stepping up the pressure of the present generating equipment for distribution to the outlying substation and was designed with a view to controlling the output of the new turbine-driven generating equipment which has recently been ordered. The circuits are so planned that the new 14,000-volt, three-phase turbine generators will operate in parallel with the existing equipment through the medium of the step-up transformers now in use.

The arrangement of the various circuits and switches for handling the current on both sides of the step-up transformers and the construction details of the transformer compartments are unusual and may be found of interest.

The current from the 2,200-volt, 60-cycle, two-phase, engine-driven generators is led to duplicate sets of busbars on the back of the machine panels in the power house switchboard. There are machine panels for each one of the generating units and one total-load panel. Below the instruments on the total-load panel is a paralleling switch for connecting the duplicate sets two-phase, 2,200-volt machine busbars. In the transformer house are six 750-kilowatt, 2,200-14,000 volt Westinghouse transformers with low-tension leads connected to the two-phase busbars in the power house and high-tension leads connected in "T" for three-phase distribution.

Building Construction.

The new transformer house is located about 20 feet away from the center of the north side of the generating station, which location is directly opposite the switchboard controlling the generating units. The building, which is entirely of steel, brick and concrete, is 91 feet long by 35 feet wide and the apex of the roof is about 45 feet above the ground level. The interior of the transformer house is divided into three rooms. The western part of the interior of the switch house is set apart as a transmission room by a 13-inch brick wall extending from the ground to the roof. A similar wall throughout the middle of the remaining portion of the building separates the other space into a transformer room and a busbar room. The floor level in all three rooms is at the same elevation as the floor in the power station. The transformer house floor is of concrete and expanded metal supported on steel beams. The basement floor is of concrete and provision has been made for the proper drainage of any overflow of oil or water from the transformer. The building is well lighted by large windows on the sides and ventilation is furnished by a row of ventilating caps along the peak of the roof.



Brunots Island Transformer Station.—Floor Plan.

Transforming Apparatus.

As earlier stated the output of the two-phase generating units is fed to duplicate sets of machine busbars in the power station, these busbars being connected at will by a paralleling switch located on one of the panels. Adjoining the machine panels are three transformer panels on each of which is mounted a switch for connecting a set of the step-up transformers in the transformer house with either of the machine busses. From the hand-throw switches on these panels the low-tension circuit is led through cables drawn in steel conduit directly to the low-tension side of the transformers.

At present there are installed three pairs of 750-kilowatt, 2,200-volt 14,000-volt Westinghouse oil and water-cooled transformers. The transformers are said to have a regulation of

.9 per cent at full load and unity power factor and 1.8 per cent at 90 per cent power factor. Each transformer, including core, case, cooling coils and oil weighs 12,700 pounds.

The accompanying illustrations will serve to show the way in which the transformers are mounted. Each pair of transformers is set in a separate fireproof enclosure with an open floor consisting of 9-inch I-beams extending lengthwise of the building. The rear of the transformer enclosure is formed by a partition wall which divides the building into halves; the two sides of the enclosures are brick walls 10 feet high and the front and top of the enclosures are made complete by ⅛-inch steel plate doors. The front doors, of which there are two, are hung so that they swing open and are provided with peep holes to enable the inspection of thermometer, oil guages and water discharge during operation. At the top of each enclosure is a single steel plate door hinged at the back and held up by a pivoted arm which is in turn kept in place by means of a rope with a fusible link inserted in it. The lengths are so proportioned that the link is directly over the hand hole in the top of the transformer. The purpose of thus supporting the roof of the transformer enclosure is that means are afforded for automatically dropping the lid and completing the enclosure except at the bottom, in the possible event of a transformer catching fire. As the transformers in their compartments are set on I-beams with 6-inch openings between the flanges, and as the 4-foot basement under the transformer compartments is also subdivided by cross walls into separate sections conforming with the transformer enclosures above, any trouble occasioned by the burning of the transformers of a single pair could not spread to other parts of the building. The basement subdivision under each transformer compartment is provided with a sewer drop to lead off any oil or water.

Brunots Island Transformer Station.—Busbar and Oil Switch Room.

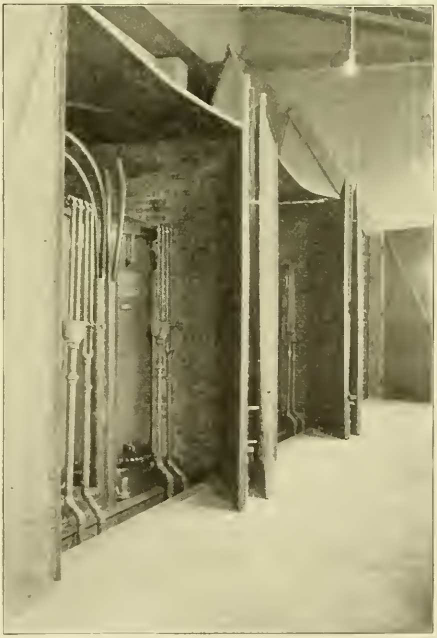
In each transformer compartment there is a live steam connection in the form of a "T" the vertical pipe of which extends up from below the floor to connect with a perforated horizontal pipe extending over the openings in the tops of the two transformers. The steam supply to these pipes is controlled by a valve mounted on the wall opposite each compartment. The officials in charge of the operation of this equipment have been thoroughly convinced by means of numerous experiments in fighting oil fires that live steam will very quickly extinguish burning oil. The steam, if turned off as soon as the fire is extinguished, is said not to injure the transformers as would water or chemical extinguishers.

Each transformer has its drain valves connected to permanent oil piping in the transformer house. This system of piping connects with a main which is led out of one end of the building and normally empties to the sewer and thus the oil can quickly be drawn off from the transformer cases if necessary. When the oil is to be saved drums can be filled from the adjustable pipe outside the house. By the use of such permanent oil piping it is expected that a larger amount of oil than usual will be saved and that the process of handling oil under ordinary conditions for the purpose of periodical inspection, filtering and cleaning will be expedited.

A continuous circulation of air which should add a material cooling effect to operating transformers is afforded by means of the ventilators in the roof and the transformer compartments' subdividing walls which are carried through to the basement floor. Air enters each of these basement divisions through a window opening covered only by iron bars and as there is a difference of elevation of 40 feet between this opening close to the ground and the ventilators in the top of the roof, a natural draft passing by the transformer cases is afforded at all times.

Switching Arrangements.

The leads from the high-tension side of the transformers consist of three-conductor, rubber-covered lead-armored cables passing out of the compartments through iron pipe and clay ducts built in the partition wall which divides the transformer room from the switch room and pass down through the wall and under the floor to Westinghouse oil switches on the busbar room floor. One set of switches is opposite each of the transformer pairs which it controls. These switches are of the three-compartment oil-break type and are remote controlled from panels in the power station. Current for their operation is taken from the exciter busses. The control button for the switches on the high-tension side of any pair of transformers is located on the base section of the panel controlling the low-tension side of the same transformer pair.

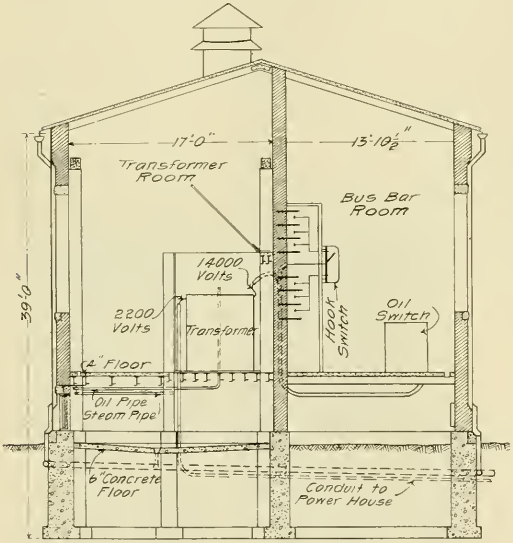


Brunots Island Transformer Station.—Water-Cooled Transformers in Fireproof Compartments.

From the oil switches the 14,000-volt current is led through concealed ducts in the floor and up through the division wall to a point midway between two sets of high-tension busbars supported on this wall. The lead from the oil switch is taken to the center point of a hook-type selector switch by means of which a transformer unit can be thrown onto either of the duplicate sets of 14,000-volt busbars. The upper terminals of the hook switches for each of the phases are connected to the upper busses and the lower terminals to the lower busses. These selector switches are in a line across the building with the transformer unit and oil switch with which they are connected.

The duplicate sets of three-phase, 14,000-volt busbars have their various conductors separated by 2-inch soapstone barriers set 9 inches in the masonry wall which supports them and projecting 15 inches. The busbars extend horizontally along the side of the division wall opposite the transformers. The conductors are of strap copper with ½-square-inch cross section so fastened to the top of the insulators that the cross section may be increased by bolting on a similar strap of metal.

The hook type of disconnecting switches which permits of any oil-switch set being disconnected from the busses, are mounted on an angle-iron frame, which also supports two 1½ x 3-inch wooden guard railings.



Brunots Island Transformer Station.—Vertical Section through Transformer and Busbar Rooms.

In the room with the oil switches controlling the high-tension current from the three pairs of step-up transformers is an oil switch by means of which the duplicate high-tension busbars may be paralleled. This switch is remotely controlled from a button in the power house on the same panel with the switch for paralleling the duplicate sets of low-tension busbars.

Transmission Room.

The high-tension busbars extend through openings in the end wall and connect with similar busbars mounted on this cross wall which sets off the feeder switch room or transmission feeder room. Current is taken to the automatic oil circuit breakers controlling the outgoing feeders by means of cables connected to the duplicate sets of busses through the medium of hook-selector switches similar to those previously described. The out-going current from the feeder switches passes through choke coils mounted on an angle-iron framework where the cables leave the building, this framework also supporting the lightning arresters and the instrument transformers.

Transmission Cable.

What is thought to be a new departure in cable construction for distribution of high-potential current is now used in connecting this station with the switching and rotary substations distributing its current. A three-conductor cable is used. Each conductor consists of a No. 0000 stranded copper cable surrounded by 8/32 of an inch of varnished cambric with a belt of 7/32 of an inch of cambric over all. The conductors and their insulation are protected by two galvanized spiral steel bands which are wound around them tightly and serve to protect the insulation from the effects of the weather or mechanical injury. This type of cable is manufactured by the General Electric Company and is designed for transmission of current at 15,000 volts pressure. One of its advantages is that owing to the small distance between conductors the inductive drop is negligible. Such a cable as now installed normally carries 225 amperes at 14,000 volts.

Operation.

It will be noted that the design of this transformer and switch house is such that the apparatus contained therein is all remotely controlled from the machine board in the nearby power house and that a unit system which is so much to be desired in such construction, has been maintained. As future conditions warrant the length of the building may be increased and more units added as desired. Duplicate sets of busses are provided for current at the various substations so that if it is desired one set of busses may be used for segregating any number of generators to supply lighting load while the other set of busses and the generators feeding into it may supply railway load. In case of accident both busses may be separated so one may carry either lighting or railway load, or both, so that an assurance is offered for continuous operation. It is the plan that all substations will observe the same arrangement of busses and that the position of a bus in any substation will correspond with those of the other stations.

The southern district of Pittsburg, including all the suburban towns nearby, is served from a switching station on the south side of the river opposite the Brunots Island power house. This station is connected with the power house by 2,200-volt, two-phase tie lines and by the 14,000-volt high-tension cables earlier mentioned. From the switching house the high-potential current is distributed to three railway stations and to three lightiug substations. The latter stations will eventually supply the energy for the entire business district of Pittsburg, which condition will be brought about by the converting of the present Thirteenth street power house into a substation.

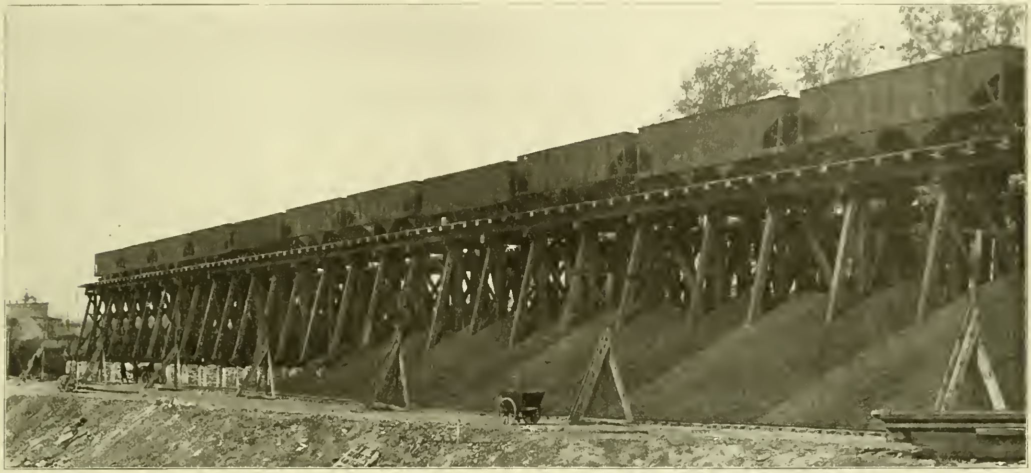
It is reported that the Youngstown & Southern Railroad, which is being equipped for electrical operation, will be running trains from Leetonia to Youngstown, O., by November 1.

There are about 50 miles of electric railway in operation at present in Australia. The lines are short ones in Melbourne, Sydney, Hobart, Ballarat and Bendigo. The further extension of electric lines is under consideration by the government of most of the states, particularly Victoria, New South Wales, and West and South Australia.

The Daily Consular and Trade Reports, issued by the Department of Commerce and Labor, state that great development is taking place in connection with railways in China and that the Chinese themselves are forming companies and raising capital for building the lines. This would seem a good opportunity for railway contractors to secure some good business. So long as there is nothing in the shape of a concession or exclusive control, the Chinese are willing to co-operate with contractors for the building of various lines.

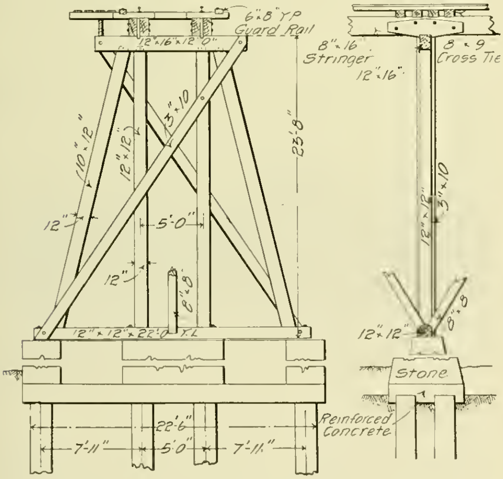
COAL STORAGE AT SECOND STREET AND WYOMING AVENUE POWER STATION, PHILADELPHIA RAPID TRANSIT COMPANY.

Within the past year the Philadelphia Rapid Transit Company has constructed a coal storage yard on a tract of land lying north and west of the company's power station at Second street and Wyoming avenue. On the east the property joins the right of way of the Philadelphia & Reading, and from a railroad siding here a switch track leads to two elevated tracks from which coal is dumped to the storage pile.



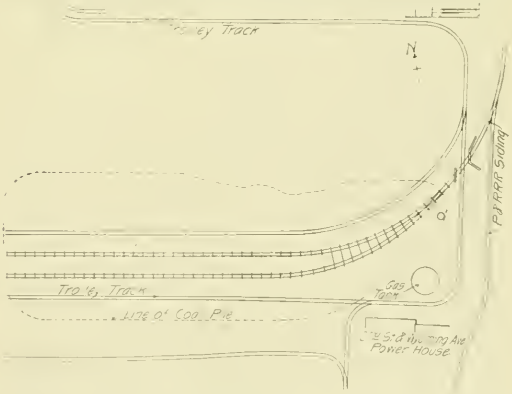
Coal Storage Philadelphia Rapid Transit Company—View of Trestles and Coal Pile.

The elevated tracks are 660 feet long measured from the point where they diverge from the entrance switch. These two tracks are 30 feet between centers and are supported on timber trestle work; the bents are 14 feet between centers, and support the rails at 28 feet above the ground, the lot being filled in some parts to bring it to the present grade. The trestle bents are of 10 x 12-inch, 12 x 12-inch and 12 x 16-inch yellow pine timbers; each bent rests upon a stone masonry pier supported on a group of six 20-inch Simplex concrete piles, the piles being capped with a block of reinforced concrete. The details of the timber trestle where the tracks are separate are shown in one of the engravings; near the point of divergence from the entrance switch the trestle bents are designed to carry the two tracks.



Coal Storage Philadelphia Rapid Transit Company.—Details of Timber Trestles.

Two tracks are laid on the ground parallel to and 30 feet from the elevated tracks. In storing coal it is dumped from the cars run on the elevated structure; after the pile reaches the height of the trestle coal is shifted laterally by means of a locomotive crane car with a clam-shell bucket on the end of a 30-foot boom. This permits the formation of a storage pile about 200 feet wide at the base, with two parallel ridges (over the centers of the lower tracks) 40 feet high and 90 feet apart. The amount of coal stored here last season was 70,000 tons.



Coal Storage Philadelphia Rapid Transit Company.—Plan of Storage Yard.

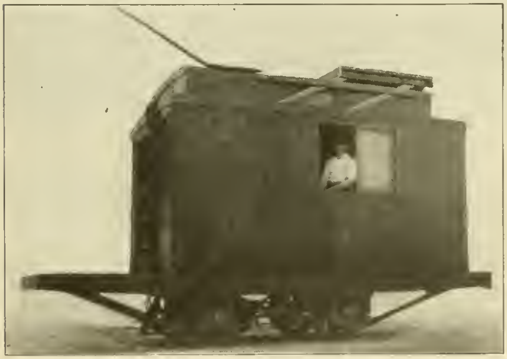
Coal is withdrawn at the east end of the storage pile, the two surface tracks being connected with the street railway tracks, so that loaded cars may be transferred to any part of the Rapid Transit system.

TOWER REPAIR CAR OF THE JOLIET PLAINFIELD & AURORA RAILWAY.

The Joliet Plainfield & Aurora Railway has in operation a line repair car in which are combined several useful features. The car is not only used by the linemen as a means of reaching the overhead work, but also affords facilities for the storage of line materials and repair tools.

As will be seen in the illustration the car is of the box type. It has an over-all length of 20 feet 5 inches and its total height above the top of rail including the tower when raised, is 16 feet. The body is 14 feet long and is set one foot from the rear end of the sills, thus giving a 5-foot platform at the forward end upon which may be carried a reel of trolley wire. The side walls are seven feet high and the deck roof is elevated 1 foot 7 inches above the side walls. The frame of the car is of 4x6-inch oak timbers and the floor is laid with 1½-inch ship-lap planking. In order to afford solidity to the framework iron strain stays ½x2 inches in section are led from the ends of the floor stringers to the frame of the trucks.

The car is mounted on a single truck with 33-inch wheels. One 40-horsepower motor is used. The controller is located on a raised platform in the centre of the car. This arrangement places the apparatus so that the motorman may serve the linemen on the tower by reaching through a sliding window without leaving his position at the controller.



Joliet Plainfield & Aurora Railway—Combination Tower and Repair Car.

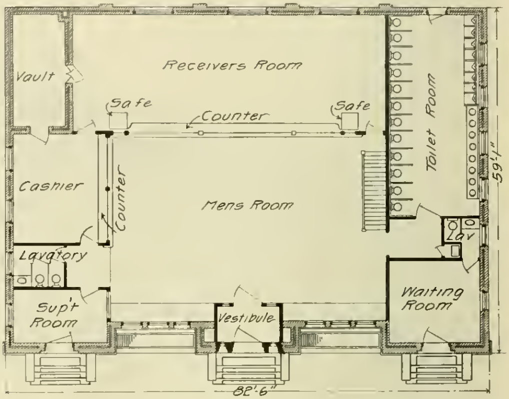
The tower has a vertical movement of about four feet and extends five feet above the roof when raised to its full height. The legs of the tower are of 2x4-inch oak timbers which are fastened to the tower platform and to the roof of the car by ¾-inch bolts. Slots in the oak plank of the roof serve as guides for the legs in raising and lowering the tower. The tower may be set at any desired point in its vertical range, its movement being governed by a ratchet lever. A good feature of this arrangement is the absence of all operating devices from the interior of the car.

The interior of the car is arranged for storage purposes in order that all materials necessary for line repair work can quickly be transported to any point on the line. By the use of the car the linemen may proceed with the work of repairing as soon as trouble is reported without the delay of waiting for the necessary material. A number of box shelves are arranged along the sides and ends in which the materials and tools are kept and in addition there are lockers for the individual tools of the linemen. A work bench equipped with a vise and other facilities for repair work is located in one corner of the car. When stock is issued to the car it is charged against line repairs although it may not be used until some time later.

The car was designed by G. G. Crane, master mechanic of the Joliet Plainfield & Aurora Railway and was built at the company's Plainfield shops.

OFFICE BUILDING AT FRANKFORD AVENUE AND BRIDGE STREET, PHILADELPHIA RAPID TRANSIT COMPANY.

Appreciating the need for better accommodations for conductors and motormen at car houses and terminal stations, the Philadelphia Rapid Transit Company has adopted the policy of providing at its new car houses, and at the old ones as well, if conditions permit, commodious office rooms for the use of conductors when turning in their accounts and, in connection therewith, rooms which can be used for meetings of the benefit association of the employes and also serve as a club room for the men when off duty. The accompanying illustrations show the office building at Frankford avenue and Bridge street which was opened June 23, 1906. The illustrations show the exterior of the building and the arrangement of the rooms on the ground floor. A stairway leads to a meeting room 20 by 70 feet in size on the second floor of the building.



Philadelphia Rapid Transit Company—First-Floor Plan of Office Building for Motormen and Conductors.

Philadelphia Rapid Transit Company—Office Building for Motormen and Conductors.

On the first floor there are provided offices for the superintendent, cashier and receivers, besides the general room and lavatory for the use of trainmen. The building is of brick 59 feet 1 inch by 82 feet 6 inches, with a slate roof.

NEW PUBLICATIONS.

American Street Railway Investments for 1906.—Thirteenth annual edition. Published by the McGraw Publishing Company, New York City. Cloth, 432 pp., 9 by 13 in. Price. $5.00.

This publication is known as the "Red Book" and is issued annually. It contains financial statistics of all the electric railway companies of the United States, Canada, Cuba and the insular possessions of the United States. The data include, in most cases, operating reports and balance sheets besides a history of the corporate organization of each company reporting. An increase of 17 pages over the edition of 1905 is noted. This increase is due partly to the addition of reports from new roads, partly to more complete statements from roads which were reported in 1905 and partly to the publication of a greater number of maps of operating properties than have appeared in previous editions. The present issue contains 49 maps showing the systems of 52 separate companies. The general arrangement of the reports and indices introduced last year, has been continued. The index includes the names of all underlying companies which have bonds outstanding, although the company may not have had at the time of publication of the book any separate corporate existence. The comparison of the gross receipts for the past two years of 437 companies, which is published in the first four pages of the book, indicates a marked increase in the earnings of the railway companies throughout the country.

Report of the Electric Railway Test Commission.—Edited by Henry H. Norris, M. E., and Bernard V. Swenson, E. E., M. E. Cloth, 621 pp, 6 by 9 in. McGraw Publishing Company, New York City, 1906. Price, $6.00 net.

This report gives results of the work done under the auspices of the Electric Railway Test Commission of the Louisiana Purchase Exposition. The organization of this commission was due to the recognition by the officials of the exposition of the fact that the large amount of electric railway apparatus gathered together for exhibition purposes offered an excellent opportunity for obtaining practical and scientific information.

Part I consists of an introduction and includes the history of the electric railway commission, its make-up and a general outline of the work done.

Part II takes up the results obtained from comparative service tests of single-truck city, double-truck city and interurban cars. The data are concisely presented and illustrated by numerous curves.

Parts III and IV are given over to the acceleration and braking tests of the three types of electric cars mentioned in the previous paragraph. In the braking tests the relative merits of the various types are brought out and the particular kind of service to which each type is adapted is demonstrated.

Part V includes some interesting results of the test of a storage battery industrial locomotive. It was found that such a locomotive has the ability to exert a considerable horizontal effort with a moderate consumption of current.

The results of experiments made to determine the alternating current losses in track rails are given in Part IV. Experiments were made with steel rails and with other steel and iron sections. The energy losses taking place in steel rails under the influence of alternating currents are compared with losses in the rails when influenced by equivalent direct currents. The effects of variations in both current and frequency values are also noted. In view of the increasing use of alternating-current motors for interurban service, these results will prove of interest.

In Part VII another interesting subject, that of air resistance, upon which there have hitherto been but little available data, is covered. The results of tests made with an interurban car operated both with and without a trailer are given. Similar data are also given for a dynamometer car specially constructed for the purpose of separately measuring the air resistance when operating with different forms of front and rear vestibules. This car is known as the "Louisiana" and was constructed by the J. G. Brill Company. A number of illustrations of the car are presented. An illustrated description of the "Louisiana" was presented in the Street Railway Review for March, 1905, page 139.

The practical nature of the data resulting from the tests described in this work and the wide range that the data cover will appeal to both the engineer and manufacturer of electrical apparatus. The work covers a field that has of late years been rapidly increasing both in size and importance. The report will serve not only as a handbook and guide for the practical man, but also as a textbook for use in the various electric railway departments of universities and colleges throughout the country.

POWER PLANT IMPROVEMENTS.

Several power plant topics of interest to electric railway engineers were discussed in papers read at the recent Atlantic City convention of the National Electric Light Association, under the title of "Fuel Economy." Mr. J. Henry Hallberg emphasized the value of the automatic carbon-dioxide recorder as a means of diagnosing imperfect combustion. He stated that neither mechanical nor hand stoking is in itself alone capable of guaranteeing the best results. It does not suffice to take occasional evaporative tests, as these do not give a reliable record of the average performance of the furnaces, nor do they show how the men usually work. Only continuous control and records can furnish such information.

The most reliable and minute control of the results of combustion is obtained by the continuous analysis of the flue gases with respect to the percentage of carbon-dioxide contained. Perfect combustion would be indicated theoretically by the presence of 21 per cent of carbon-dioxide in the flue gases, but on account of the excess of air required to burn coal in furnace practice the highest attainable heat from the smallest amount of coal is represented by about 15 or 16 per cent of carbon-dioxide. A large number of furnaces never offer more than 7 or 8 per cent of carbon-dioxide, corresponding to a loss in fuel of 21 to 20 per cent. This applies to both mechanically and hand fired furnaces.

It is in the power of every engineer to improve considerably the working results of his installation by continuous carbon-dioxide records. A few days of experimenting will determine the exact draft pressure necessary for the most perfect combustion, and the dampers can then be regulated accordingly. It will not be difficult to ascertain what method of firing will bring the best results, and what thickness of fire should be maintained. Flaws or cracks in the brickwork, or holes in the fire, will easily be detected and at once remedied. Not infrequently changes in the size or design of the grate, or improvement in the flues or chimney suggest themselves. The carbon-dioxide apparatus should be operated continuously. A large number of these recorders have been in service abroad during the past four or five years, and in most cases the fuel saving has paid for the recorder in six months' time. Where the firemen are accustomed to work by the recorder, one instrument may take care of from four to six furnaces. The recorder of the Arndt type occupies about 3 x 4 feet of floor space, stands 6 feet high and costs about 30 cents per week for operation when used on day and night shifts. It is particularly useful in plants where the load fluctuates a great deal. This apparatus will enable a manager to get better service from inexperienced firemen in case of a strike, will facilitate the distribution of premiums to the man with the highest carbon-dioxide record, and can be used to advantage in producer gas plants.

A paper was read at the convention by Mr. E. F. Cassel, his topic being the design and manufacture of hydro-electric installations as a whole. The author noted the increase in the size of waterwheels during the last few years, and emphasized the importance of manufacturing a hydraulic plant as a complete machine instead of an assembly of individually manufactured parts. The maintaining of efficiencies under widely varying pressures in the same plant, the maintaining of uniform speed under widely varying volumes of water at different times of year without serious loss in efficiency, the holding of close regulation with inelastic water instead of elastic steam all illustrate the necessity of giving the design of the hydraulic turbine different consideration from that of the steam engine when used in electric generating plants.

In a hydraulic installation the water pressure and the minimum amount of water available are fixed physical conditions which cannot be varied at the will of the designer. Too many turbine specifications are written with regard only for the generator speed. The modern high-speed turbine runner is absolutely unfitted for high efficiencies except under exact conditions of head and speed; a comparatively slight variation in either of these quantities is fatal to the theory upon which the runners are designed. If the limits of speed proposed in the turbine do not quite permit of a standard generator, the use of a different specific speed in the design of the turbine runner will often permit the use of a standard generator and still preserve in the turbine the high efficiencies required under the varying conditions of head and volume of water available and power required, resulting in a decided economy, both in first cost and in the amount of water used in operation—an important item to the purchaser. If the manufacturer becomes equally interested with the consulting engineer and the purchaser in the actual performance of the installation as a whole, the results desired will easily be achieved.

Mr. Cassel concluded by emphasizing the importance of the governor problem in hydro-electric installations. Numerous sets of specifications have been distributed, calling for results to be achieved by the governor without any notice being given or any importance attached to either flywheel effect, inertia of water in penstock or draft tube, or action of relief valve, all of which have a direct bearing upon what it is possible for a governor to do. With the specifications, separate bids are asked for the governing apparatus. The prevailing impression seems to be that all that has to be considered is the movement of the turbine gates within a given time. Mr. Cassel advocated the design and manufacture of the governor by the turbine maker, claiming that the rotating parts of the generator and turbine, the relief valve, penstock and draft tube are as much a part of the governor as the flyballs themselves. If the entire installation were designed, manufactured and guaranteed as a whole, the difficulty of determining results would be practically eliminated. There would be no further necessity for determining the efficiencies of generator, turbine, exciter and exciter turbine separately, with the necessary allowance for thrust bearing friction, governor drives, etc., as at present. The same efficiency would be required, but would readily be measured by actual electrical output, with no shifting of responsibility in case of failure.

In a paper, entitled "How to Make a Small Plant Pay," Mr. D. F. McGee summarized a number of points which apply with equal force to the lighting and the railway power house. He stated that it has been proven that an entirely modern equipment is not necessary to the financial success of an electric plant, and a wise manager will hesitate before he will consign to the scrap heap equipment, which, by overhauling and judicious arrangement, may be operated at a net efficiency equal to the latest equipment besides saving for his company the amount required for new machinery and the increased fixed charges. He advocated making the most of the facilities at hand, taking care of uncovered or leaky pipes, leaky valves and joints, improper setting, careless firing, injudicious selection of fuel, scaly boilers, inadequately heated feed water, improperly set valves in engines, poor line construction, inefficient transformers and badly designed feeder systems.

An exhaustive report was submitted by the association's committee on the "Investigation of the Steam Turbine." A thorough description of the latest forms of Curtis, Westinghouse-Parsons and Allis-Chalmers turbines was appended, together with a report on "Continental and English Turbine Practice" by Mr. I. E. Monetrop. Special effort was made to bring out the most recent improvements in turbine construction. The mechanical construction of the Curtis turbine has been improved in some cases by making the larger wheels from steel or boiler plates, two plates being bolted to a spider, the spider being placed between the plates and the buckets riveted at the outer edge with a flange of the bucket sections on the inside of the wheel; the two sets of buckets are so arranged that they have a smooth external surface, reducing the friction of the wheel. The Curtis valve gear has been improved in the interests of simplification, elimination of noise from the gear drive, and improvement of appearance. Accessibility and lubrication have received careful attention. The friction load on the governor is almost completely eliminated by the fact that the parts which have to be moved endwise by the governor are revolving in their bearings. A straw taken from a broom will suffice to move the 100-kilowatt gear back and forth. The speed of the turbine buckets has been in some cases increased from 325 or 350 feet per second to 450 and 460 feet per second. The consensus of opinion favors water instead of oil for step bearings. The clearance spaces have also been somewhat increased in the Curtis turbine without any material sacrifice of efficiency. The revolving fields are now mounted with two keys, one at either end of the shaft, so as to prevent twisting of the keys which has interfered with the removal of the field from the shaft.

During the past year the Westinghouse-Parsons turbine has been improved particularly in the type of lacing used in the blading. The lacing now in use in cross section is similar to the "apostrophe," and the thin edge is bent over between each blade insuring uniform spacing and a tighter joint than was possible with the flat lacing twisted. The extra lacing which was introduced at the joints has been abandoned; it was claimed that where the blades touch the casing of the turbines the cast-iron casing had been cut and the blading had not been destroyed. The double-flow type of turbines has been very materially changed in both design and construction, to obviate the necessity of using large balancing pistons, which materially shortens the length and reduces the diameter, making the machine more compact.

Profit-Sharing Trolley Line.

Consul J. C. Covert reports from Lyons that a profit-sharing system has been adopted by the street railways of that French city.

The amount distributed will be $500 for each franc (19.3 cents) of dividend earned by the company over 35 francs ($6.75) per share. The shares are 500 francs. This year the company earned 40 francs per share. As a consequence $2,500 will go to the employes, two-thirds of the sum to their general relief fund, and one-third to personal relief for sickness. The company also makes other stipulated contributions to the relief funds, the full details of the agreement being on file at the Bureau of Manufactures. The employes bind themselves not to ask for increase in wages for three years. Heretofore there have been frequent strikes.

The Joliet Plainfield & Aurora Railroad, a twenty-mile road connecting Joliet and Aurora, Ill., on July 4 carried 13,162 passengers and earned $3,005.95.

RECENT ELECTRIC RAILWAY LEGAL DECISIONS.

BY J. L. ROSENBERGER, LL. B., OF THE CHICAGO BAR.

Repair Shop a "Workshop" Under Labor Law.

Hoffmeyer v. State (Ind. App.), 77 N. E. Rep. 372. March 27, 1906.

A shop owned and controlled by a traction company, of which it appears that the principal work is in the way of repair for the purpose of keeping the cars and other appliances of the traction company in condition to carry on its business and in which to an inconsiderable extent some articles are manufactured, the appellate court of Indiana, division No. 2, holds is a "workshop" within the meaning of an act concerning labor applying to a workshop where persons are employed for hire and requiring accidents therein to be reported to the chief inspector of the state.

Value of Entire Abutting Properties to Be Considered in Determining Suffiency of Consents.

Fox v. New York City Interborough Railway Co. (N. Y. Sup.), 98 N. Y. Supp. 338. Apr. 6, 1906.

Section 91 of the New York railroad law requires for the building of a street surface railway or extension thereof the consent in writing of the owners of one-half in value of the property bounded on that portion of the street or highway upon which it is proposed to build same, the value of such property to be ascertained and determined by the last assessment roll. The first appellate division of the supreme court of New York says that the provisions apply to cities, towns and villages, to city streets and country highways, to 25x100-foot city lots, and to suburban estates and country farms, if they are held in one ownership and are bounded by the street or highway. It believes it to have been the intention of the legislature, and it announces it as the rule of law, that in considering the question of the valuation of property for the purpose of determining whether the necessary consents have been obtained, the value of each entire parcel of land, with the buildings thereon, as appearing upon the assessment roll for the appropriate year, is final and conclusive.

Running Extra Cars Close Behind Regular Ones—Using Whistle Instead of Gong at Crossings.

Hattcher v. McDermot, Receiver of the City & Suburban Railway of Washington (Md.), 63 Atl. Rep. 214. Feb. 13, 1906.

"There is no principle of law which precludes a railroad company from sending extra trains or engines over its road whenever the necessities of its business may require. Most assuredly it is not negligence to do so. There is nothing, then, in this circumstance from which negligence can be properly inferred." So it was said in An. & Balt. Short Line R. R. Co. v. Pumphrey, 72 Md. 82. And that being the law in reference to steam railroads, upon which trains are usually made up of a number of cars, to which other cars can be added when required, it is even applicable, the court of appeals of Maryland says, to electric railways running through the country, as circumstances may often arise which require extra cars to accommodate the public, especially in case of a suburban railway near a large city. Nor was there anything in the record in this case to show that it was negligence to run the extra car and the other so close together as to be but about 14 seconds apart. On a single-track railway it may be necessary that they be close, in order to pass those coming from the opposite direction without unnecessary delay, so that both can occupy a switch or siding at the same time.

Electric cars must be run in a reasonable way, and should give some signal when approaching public crossings. But the plaintiff could not properly establish negligence on the part of the defendant by simply showing that no gong was heard, without some evidence that no other sufficient warning was given. The mere fact that the gong was not rung would not be sufficient evidence of negligence on the part of the defendant, for it might be that the warning of a whistle, such as is now frequently, if not generally, used on suburban and country electric cars may have been sounded, or other sufficient signal given, instead of using a gong.

Requisite to Petition in Action for Conductor Mistaking White for Colored Passenger.

Wolfe v. Georgia Railway & Electric Co. (Ga.), 53 S. E. Rep. 239. Jan. 13, 1906.

If it be actionable per se (by itself), as against a street railway company, for its conductor, in endeavoring to comply with the statute requiring the separation of white and colored passengers, to negligently mistake a white passenger for a colored one, and in the presence and hearing of others inform him that he must be seated in the portion of the car set apart for negro passengers, the supreme court of Georgia holds that it is essential to the maintenance of such an action that the petition allege the plaintiff to be a white man. The petition in this case not containing such necessary allegation, it was properly dismissed on general demurrer. Whether, with the allegation, the action could be maintained, the court does not decide.

Power of Municipality to Provide for Separation of Races on Street Cars—Validity of Ordinance and Reasonableness of Regulation—Exception of Nurses—Passenger Without Right to Any Particular Seat.

Patterson v. Taylor (Fla.), 40 So. Rep. 493. Feb. 6, 1906.
Crooms v. Schad (Fla.), 40 So. Rep. 497. Feb. 6, 1906.

Although the municipality of Jacksonville is not by its charter of incorporation expressly authorized to provide by ordinance for the separation of the races on the street cars in such city, yet, the supreme court of Florida holds, in the first case named, it has such authority in the general welfare clause of its charter, enabling it "to pass all ordinances necessary for the health, convenience, and safety of the citizens, and to carry out the full intent and meaning of this act, and to accomplish the object of this incorporation." But even without such general welfare clause, or other express authorization, the design of such an ordinance being to safeguard the peace and good order of society within such city, its enactment and enforcement is within the incidental police powers of the city directly resulting from its incorporation into a municipality.

An ordinance of a city designed to separate the two races upon the street cars in such city, that requires the companies operating such cars to effect such separation in one or the other of two clearly defined modes: (1) By providing separate cars for the two races; or (2) by division of the car when the same car is assigned to the two races—leaving it discretionary with such carrier as to which of the two prescribed modes of separation it will adopt, is not an unauthorized delegation of authority or discretion to such carriers.

A passenger on a street car has no right to any particular seat in such car, nor to a seat in any particular end of such car, and a regulation of a street car company, acting under the provisions of a city ordinance designed to effect a separation of the races on such cars, by which the seats in the rear end of its cars are assigned to the use of passengers of the colored race and the seats in the front end of such cars to passengers of the white race, or vice versa, is not an unreasonable regulation, nor an unlawful discrimination between the races.

In the second case, the supreme court of Florida holds that section 18 of chapter 4513 of the laws of Florida of 1895 that provides as follows: "The council shall have power to pass, for the government of the city, any ordinance not in conflict with the constitution of the United States, the constitution of Florida and the statutes thereof," authorizes the municipality of Pensacola to adopt and enforce an ordinance requiring a separation of the races on the street cars in such city.

An exception of nurses in charge of children and invalids from the operation of a city ordinance requiring under penalties the separation of the races on street cars in the city, is a proper and reasonable classification, and does not render such ordinance invalid, unjustly discriminative or unreasonable.

Injury to Passenger from Fall of Register—Insufficient Inspection.

Weir v. Union Railway Co. of New York City (N. Y. Sup.), 98 N. Y. Supp. 268. Apr. 6, 1906.

Where an apparatus for registering fares collected from passengers, called both a "register" and a "clock," which was attached to the car by brackets and was at the top held in position by a prong about two inches long, fell without apparent cause and struck a passenger, inflicting some injury, the first appellate division of the supreme court of New York holds that the case was controlled by the maxim res ipsa loquitur (the matter speaks for itself), and that the obligation rested upon the defendant to explain the accident. The defendant undertook to explain the cause of the accident, and it was attributed to a defect in the casting of the prong, in which it was claimed that there existed an air bubble or blister. Proof was offered that the car and everything connected with it was regularly and frequently inspected by servants of the defendant who were charged with the performance of that duty, and the attempt was made, also, to prove that the defect in the prong could not have been detected by inspection. But the court holds that, under the condition of the evidence, the jury were justified in finding that the defendant had not satisfactorily explained the accident, and that there had not been reasonable and proper inspection of the prong, it appearing in evidence that the defect would have been revealed had the prong been tested by a hammer.

Liability for Accident Caused In Carrying Freight—Right to Use Coal Cars and Haul Materials for Own Use—Conductor's License Not Required By Motorman on Rear of Coal Car.

Caswell v. Boston Elevated Railway Co. (Mass.), 77 N. E. Rep. 380. Mar. 2, 1906.

A car in which coal was being transported collided with a milk wagon at an intersection of streets at about 4:30 a. m. If the accident had been caused by an unlawful use of its tracks and cars in carrying freight for hire, the defendant, which was incorporated for the transportation of passengers and was not authorized to engage in the business of carrying freight for others, might well, the supreme judicial court of Massachusetts says, have been found guilty of negligence. But the construction and maintenance and management of a street railway involve the use, at different times, of many kinds of material, at different places along its lines, and a street railway corporation has the same right that any one else has to use the streets in a reasonable way in the transportation of anything which it is reasonably necessary to transport as incidental to the proper management of its legitimate business. It must lay its rails and the timbers supporting them, and if a reasonable way of bringing them near the place where they are to be laid, either for original construction or for repair of the tracks, is upon cars propelled over their tracks, it is not unlawful so to bring them. If power houses in which coal is burned for the production of electricity, to be used as power, are necessary at different points on its lines, such a corporation may maintain them. and supply them with coal by carrying it in cars along its track, if that is a reasonable way of doing the business. The provision of section 55 of chapter 112 of the revised laws of Massachusetts goes further, and authorizes the carrying of material for the construction or repair of streets, even when it is not incidental to the maintenance or operation of the railway. The court finds nothing in this case to show that the defendant was negligent in using coal cars upon its tracks.

It was the duty of the motorman, or, as sometimes called, trolleyman, in charge of this coal car to stand at the rear end of the car and look out for the trolley strings, and also to turn the switches and load and unload the coal on the car, which was so constructed that, from his position at the rear, he could not see teams coming in front. His duties did not correspond generally with those of a conductor, and the court thinks that it might well be found that he was not a conductor within the meaning of the statute of 1897 relative to licensing conductors, while even if there was negligence in his failure to obtain a license, negligence as to his license imposed no liability for this accident upon the defendant.

Railroad Commissioners Without Power Over Electric Railways and Cannot Authorize Crossing—Not "Railroad Company" Under Statute—Permission to Use Steam Does Not Make Railroad Operated By Steam.

Kansas City, Outer Belt & Electric Railroad Co. v. Board of Railroad Commissioners (Kan.), 84 Pac. Rep. 755. Feb. 10, 1906.

In giving the board of railroad commissioners supervision over railroads operated by steam, the Kansas statute, by implication, the supreme court of Kansas holds, denies them power over railroads operated only by electricity. In defining the term "railroad company" as used in the railroad commissioners' law to mean a company whose road is operated by steam, the statute forbids such term being construed to include a company owning a road operated only by electricity, except where such intention may be expressly manifested.

The section of the statute which gives the board of railroad commissioners authority to hear and determine the application of a railroad company for permission to cross its track "with any other railroad upon the grounds of such other railway corporation" does not apply to a case where a railroad company seeks to cross the track of a railway company whose line is operated entirely by electricity.

A line of railway which is so constructed as to be operated only by electricity, and which is in fact so operated, is not a railroad operated by steam, within the meaning of the railroad commissioners' law, even although it is owned and managed by a corporation whose charter permits the use of steam as a motive power.

The board of railway commissioners has no jurisdiction to entertain an application by a railroad company for leave to cross its track with that of a railway company using only electricity as a motive power.

Measure of Damages in Condemnation Proceedings for Interurban Railway Over City Street.

Abbott v. Milwaukee Light, Heat & Traction Co. (Wis.), N. W. Rep. 523. Jan. 9, 1906.

The company, operating an interurban street railroad over a city street, undertook to condemn, and permanently appropriate, all the rights of property which entitled persons interested in property along the right of way to damages caused by the operation and maintenance of an interurban street railroad business, on its double-track railroad upon this public highway. But it was claimed that in this proceeding no damages for the taking and appropriating of a portion of the street as a right of way for the location of its tracks should be allowed the property owners affected, since the city had granted the right to it to lay such tracks within the street, for conducting a city street railroad business, and because such occupation of the street by the tracks was not a servitude additional to those contemplated by the original dedication or taking of the land for the purpose of a public highway. The supreme court of Wisconsin, however, holds that this claim was not well founded. It says that in its legal effect the proceedings instituted by the company was an assertion by it as an interurban street railroad of the rights granted by sections 1862 and 1863a of the revised statutes of Wisconsin of 1898, under which, pursuant to the privileges granted by the city to occupy the street in question, it might acquire the right of way for its road and thus, for the purpose of conducting its transportation business, obtain a perpetual interest in the real estate of the plaintiff. It was obvious that this action of the company was not based on any rights or privileges which had been bestowed on it by the city for affording facilities to persons to pass and repass on the streets as a public highway, but that it was taking property under the power of eminent domain, for which it must indemnify the plaintiff. The true rule is that the measure of damages is the difference, if any, at the time of the filing of the commissioners' award, between the market value of the premises with the road located upon it, and the market value at that time freed from the use and burden of the road.

Ordinances Held to Extend Franchises of Part of Consolidated System to Expire Without that of Main Line—25-Year Law not in Way—Expenditure on Change to Electrical Power Consideration for Ordinance.

Cleveland v. Cleveland Electric Railway Co. (U. S., Ohio), 26 Sup. Ct. Rep. 513. Apr. 9, 1906.

By a consolidation of two companies were brought together lines with franchises expiring in 1904 and 1908 respectively. After the consolidation four ordinances were passed relating to certain lines aggregating about 7 miles in length which rested for their initial grant on an ordinance of 1879 granting the franchise expiring in 1904. The first, second and fourth of these four ordinances authorized the laying of additional tracks, while the third granted to the consolidated company the right to use electricity in operating its entire line of street railroad. The grant in the first of these four ordinances was on the express condition that no increase of fare should be charged by the company on any part of its main line or said extension, so that but one fare, not to exceed 5 cents, should be charged between points on said company's main line or extension, and it was provided that "the grant here granted shall terminate with the present grant of the main line, to wit, 10th day of February, 1908." This language was substantially repeated in the other three ordinances.

The supreme court of the United States thinks it clear that the city intended to extend that part of the system of railways in question until February, 1908. It says that the extension was not for an unreasonable time. One of the grants did not expire until 1908, and it was reasonable to continue the other till that time. What policy or purpose could be urged against it? The suggestion does not commend itself, which was made, that possibly it was the purpose of the city to preserve different dates for the expirations of the grants, so that, the company coming to the city with its line in fragments, the city could consider whether concessions in the public interest might not be required as a condition of the renewal of rights. To adopt the suggestion we must suppose a situation more difficult than that presented. Forethought of the public interests must be attributed to the city council when it passed the consolidation and other ordinances. There was an immediate public benefit to be considered, and the time of extension was not so long as to cause a dread of unforeseen conditions or to make necessary a provision for them. Besides, inducement to the company had to be offered and secured.

Nor does the court think the extension beyond the power of the city council to grant notwithstanding that it was urged that by section 2502 of the revised statutes of Ohio there can be no grant or a renewal of a grant for a longer period than 25 years, and notwithstanding that it was further urged that by said section a municipal corporation could not, during the term of the grant or the renewal thereof, release the grantee from any obligation or liability imposed by the grant.

Furthermore, the court cannot believe that the expenditure of $700,000 on the change to electrical power was unworthy of consideration by the city, or that the city intended to exact it as an obligation that could be imposed on the company, or regarded it as anything but a benefit to the city, to be recompensed and secured by the ordinance which was passed.

Liability for Injury from Using Iron Shovel About Third Rail in Removing Snow.

Smith v. Manhattan Railway Co. (N. Y. Sup.), 98 N. Y. Supp. 1. Apr. 6, 1906.

The plaintiff, who had for nearly six months been a member of an electrical repair gang, while shoveling snow off the track and from around the rails with a shovel having a wooden handle and an iron scoop or bowl, pursuant to the direction of his foreman, touched the iron bowl of his shovel against the third rail and at the same time brought it in contact with a bolt projecting from a tie which communicated with the earth, thereby causing a short circuit, resulting in an explosion and flash which burned him and injured one of his eyes. He knew that the third rail conveyed a current of electricity, but, according to his testimony, he was not familiar with short circuits, and did not know what would produce a short circuit, or that one would be produced by an iron surface coming in contact at the same time with the third rail and a projecting bolt, and he had not been instructed on that point. He understood—and the undisputed evidence showed it to be a fact—that there was ordinarily no danger in touching the third rail. The evidence showed that no injury would result from bringing even an iron shovel in contact with the third rail so long as it did not at the same time come in contact with another iron connected with the track. This, the first appellate division of the supreme court of New York says, was not an obvious danger. It was one which a layman would not be likely to know or discover unless specially instructed, or unless he happened to observe the effect. Manifestly, it was the duty of the defendant to furnish the plaintiff with a broom or a wooden shovel, especially in the absence of instructions as to the danger of causing a short circuit. The jury were justified in finding that the foreman directed the plaintiff to use the iron-bladed shovel without furnishing him gloves, or informing him how a circuit might be produced, or warning him of the danger of injury therefrom. The questions, therefore, of the plaintiff's contributory negligence and assumption of the risk and of the defendant's negligence were for the jury, which in this case rendered a verdict in the plaintiff's favor. The court is unable to agree with the view that he voluntarily assumed the risk of injury from using the iron shovel as he used it.

Connection of Tracks of Traction Company With Those of Company Organized Under General Railroad Laws Not Authorized—Statute no Aid—Power of Municipality Supreme—Whether a General Railroad Can Own or Operate a Street Railway in Michigan Unsettled—Additional Feed Wire Not Trolley Wire and Unauthorized.

City of Monroe v. Detroit, Monroe & Toledo Short Line Railroad Co. (Mich.), 106 N. W. Rep. 704. Mar. 13, 1906.

A grant authorized a traction company "to construct, equip, own, maintain and operate a street railway for conveyance of passengers and baggage with all the necessary and convenient tracks, side tracks, switches, turntables, turnouts, and connections, * * * subject to the regulations hereinafter contained * * * a single track with necessary switches in, upon and through Elm avenue. * * * All tracks provided for in this ordinance shall be constructed under the supervision and with the approval of the common council." The supreme court of Michigan thinks that it would be placing upon this language an unwarranted construction to hold that it authorized the traction company to make a connection in the streets with the tracks of a corporation organized and operating under the general railroad laws. The fact that a connection was provided for and required to be made by the traction company with another company, with transfers to be given from the one road to the other, would not authorize a connection of the traction company with the railroad company first mentioned, although the latter had absorbed by lease the traction company and the other company with which the traction company was to make connections, because no grant by the city had been given to the said railroad company.

Nor does the court consider that the train railway act was authority for making the connection in dispute, the traction company being entirely within the limits of the municipality under the terms of a grant accepted by it. This statute was amended, some years after its enactment, for the purpose of allowing corporations organized under it to use and operate street railways, and section 41 thereof provides that companies organized under the act shall have the right to make connection with any other railroad corporation, and further provides that when a road is so organized and is intersected by any new road it must unite with such road in making a connection, and grant running and business facilities. But the court says that the right of a municipality to refuse its consent to the use of its streets by a street railway is an absolute one, and its power in the first instance to impose conditions is unlimited. The legislative intent to continue the control of public streets in the municipal authorities is clear. Section 41, which is the last section added to the act, must be construed with reference to the provisions of the preceding sections.

Whether a general railroad can own or operate a street railway under the laws of Michigan, the court says is a serious question, which it was not necessary to pass upon in this case.

Lastly, the court holds that where an ordinance provided that "no wires carrying an electric current shall be placed in said street except the trolley wire," an additional feed wire placed in the street was not a trolley wire, and was put in without authority.

Power to Compel Company to Lower Tunnel Under Navigable River—Not Impairment of Contract Obligations or Taking of Private Property.

West Chicago Street Railway Co. v. Illinois ex rel. Chicago (U. S., Ill.), 26 Sup. Ct. Rep. 518, Apr. 9, 1906.

The city council of Chicago in 1888 adopted an ordinance which authorized the West Chicago Street Railway Company to construct a tunnel under the Chicago river, said tunnel to be used by the company for street railroad tracks. When this ordinance was passed there was in force the horse and dummy act of 1874, which provided that the location and construction of a road across or over any waters in the state should not "interrupt the navigation of such waters." In 1900 the city council passed an ordinance directing the company at its own expense to lower the tunnel so as to provide for a clear depth above it of at least 21 feet of water at all times.

In resisting the enforcement of the last-mentioned ordinance, great stress was placed by the company on the fact that it was the owner in fee of the bed of the river at the point where the tunnel was constructed. But the supreme court of the United States says that fact was not vital in the discussion; for it was adjudged by the state court—in harmony with settled doctrines—that the title to land under a navigable river is not the same as the title to the shore land, that it is subordinate to the public right of navigation, and that the city could not, if it would, grant the right to obstruct the navigation of the river, or bind itself to permit anything which has become an obstruction to be continued.

The court, moreover, does not agree with the contention that, the tunnel having been constructed under a valid contract with the city, the mere order to remove or lower the tunnel impaired the obligation of that contract, in violation of the constitution. It not only finds no provision in the ordinance restricting the power of the city in this respect, but it says that, as the city could not legally adopt an ordinance inconsistent with a statute of the state, there must be read into the ordinance that part of the act of 1874 referred to above. Nor does the court agree with the contention that even if the tunnel was an obstruction to the navigation of the river by large vessels, the lowering or removal of the tunnel, against the company's will, would be a taking of private property for public use without compensation, in violation of the constitutional guaranty of due process of law.

Validity of Ordinance Requiring Macadamizing of Whole Width of Street—Burden of Proof as to Reasonableness—Companies Bound by Restrictions in Ordinance Granting Location.

Mayor, etc., of Borough of Rutherford v. Hudson River Traction Co. (N. J. Sup.), 63 Atl. Rep. 84. Feb. 26, 1906.

The New Jersey traction act of 1893 provides that, upon application being made to the common council for a location of street railway tracks, the council, after advertisement and hearing, "shall either pass a resolution refusing such location, or pass a resolution or ordinance as may be necessary or proper, granting the said location or any part thereof, under such lawful restrictions as they deem the interests of the public may require." It was insisted that the power conferred by the legislature upon the common council was limited to either denying the application for a local franchise or granting it subject to reasonable restrictions, and that the imposition upon the company of the duty to pave with 6-inch macadam the whole width of the street was not a reasonable restriction, but an attempted exercise of the power of taxation. Hence, it was said that this requirement was ultra vires (beyond the power of) the municipal corporation.

But the question of whether such restrictions are reasonable, the supreme court of New Jersey says, is a question of fact, and the burden of proof is upon him who asserts that the formal action of a municipal body contains elements so unreasonable as to render the action ultra vires. And, the company having failed to show that the macadamizing from gutter to gutter required in this case was unreasonable, the court holds that it was not unreasonable.

The ordinance having been carried into effect by the construction, maintenance, and operation of the street railway, the traction company and its successors in title, while retaining and enjoying the privileges and franchises granted by the ordinance, the court holds, could not resist the claim of the municipality for enforcement of the restrictions on the plea that the ordinance was ultra vires the municipal corporation.

Where an ordinance granting a location for street railway tracks pursuant to the general traction act of 1893, contains restrictions in the form of covenants requiring the traction company to pave the street in which the tracks are laid, the fact that performance of this covenant would to some extent relieve the municipal treasury from expense does not taint the proceeding; there being no interest on the part of the members of the council beyond their interest as ordinary taxpayers.

And where an ordinance grants a location of street railway tracks to a traction company and its assigns, subject to restrictions and conditions to be observed and performed by the grantee, the restrictions and conditions are obligatory upon any subsequent purchaser of the street railway tracks and franchises, even without an express assumption.

PIPING AND POWER STATION SYSTEMS.—XX.

BY W. L. MORRIS, M. E.

The valve shown in Figure 183—(D1-2) has a loose-fitting piston, the clearance affording an opening for the waste from the chamber, a, which is put under pressure by the relief valve, b. The chamber, c, is always open to the atmosphere. The stem, d, slides loosely in the sleeve. The drain, e, is made of sufficient size to take care of all drips past the piston and stem. The capacity of the valve, b, should be made greater than the leak past the piston. This type of valve is readily reground and requires no close-fitting or tight pistons. The valve may be placed in the reverse position to that shown in the illustration by the use of the spring f, which has sufficient tension to support the valve.

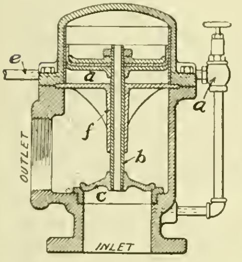


Figure 182-(D1-1).*

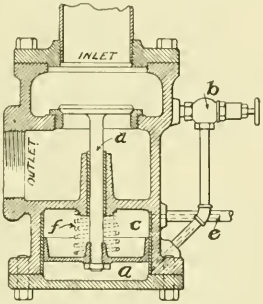


Figure 183-(D1-2).

Another type of relief valve is shown in Figure 184—(D1-3). This valve requires pressure in the chamber, a, in order to decrease the resistance to the flow of water at the valve. The piston is open to the atmosphere and the small leakage passing it may be piped away. This valve may not be as complete a relief valve as those shown in Figures 182 and 183, but its simplicity is a good feature.

There are various methods employed in the general construction of feed lines. It is the general practice to use iron pipe for cold-water lines carrying water at a temperature of less than 200 degrees and brass pipe for high-temperature lines carrying water at a temperature above 200 degrees. If the working steam pressure is not over 175 pounds full weight iron pipe is frequently used. Above that pressure extra heavy iron pipe is used. The heavy pipe is used, not because the lighter pipe will not stand the pressure, but in order to insure longer life.

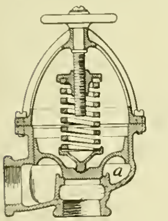


Figure 184-(D1-3).

The material to be used in the construction of feed lines depends largely upon the water to be handled. If low-temperature water passes through the mains a lighter weight iron pipe may safely be used, since with low temperature there will be no trouble from scale or pitting. If the water is chemically treated before it is fed to the boilers, it will neither scale nor pit the pipe, even though the water be raised to a high temperature. If an open heater is used and the temperature is raised to the boiling point, or 212 degrees, pitting will not occur, but the water may deposit scale. The smoother the interior of the pipe the less trouble there will be from scale. If it is known that the water tends to scale the pipe there will then be no danger of its pitting or eating the pipe. In this case seamless-drawn iron tubes may be used and afford a smooth, clean main. In ordinary practice, however, screwed iron pipe of full or extra heavy weight is used.

If the feedwater contains acids which, while preventing scale, eat the iron pipe, the feed main should be made of seamless brass tubing ⅛ inch or less in thickness. It is not practicable to use screwed connections with light brass tubing. Such tubing is expanded into cast iron flanges with a tube roller and the end of the tube turned back on the flange as shown in Figure 185—(D1-4). To prevent the flange from working back while the end of the tube is being turned over, the diameter of the tube is increased at the point, a, back of the flange.

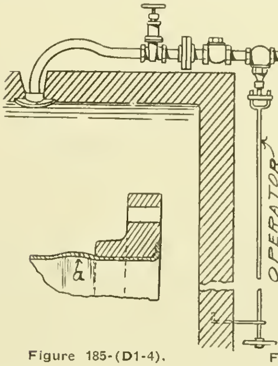


Figure 185-(D1-4).

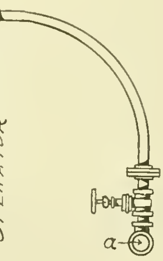


Figure 186-(D1-5).

It is a common practice to make feedwater mains and branches of brass pipe of the same diameter as iron pipe which would serve the same purpose. The thickness of the brass pipe should be about the same as that of the commercial weight steel pipe generally sold. This weight of pipe should not be understood as the "full weight" pipe generally found in pipe tables. Fittings should be of flanged cast iron regardless of what the material of the pipe is made. Screwed fittings should not be used on pipe of greater diameter than 2 inches.

A very satisfactory arrangement of feed mains, since they are generally 3 inches or more in diameter, is to use brass tubing as shown in Figure 185 and make the boiler branches, which may be 2 inches or less in diameter, of standard threaded brass pipe. If the branches are 2½ inches in diameter and are flanged throughout it is nevertheless good practice to make them of brass pipe of iron pipe size, because it is less expensive to use pipe than to bend the tubing. The boiler branches usually consist of numerous small pieces which if tubing were used would require the attaching of a large number of flanges. If 2-inch branches are used the valves and fittings should all be screwed.

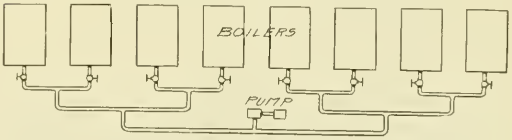


Figure 187-(D1-6).

The fittings, such as elbows, tees and flanged unions should be of extra heavy cast iron. It is unnecessary to install brass fittings for feed-water service and their use will increase the cost of the piping system. If fittings of brass were used they would be of a lighter pattern than cast iron fittings while in reality they should be of a heavy pattern so that they would not stretch under any ordinary conditions of service. It is better for a fitting to break than to stretch because if a fitting is broken during erection a new one can be substituted immediately, but if a fitting is strained its joints cannot be closed without excessive tension on the threads. Good joints are easily made between brass pipe and iron fittings while joints of brass pipe with brass fittings are difficult to make. When two metals in a joint are united with the threads turning under heavy compression, one metal should be hard and the other soft. If they are of the same degree of hardness the threads of one will tend to destroy those of the other.

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*Figure 182-(D1-1) here shown should accompany the description in place of the cut shown as Figure 182-(D1-1) in "Piping and Power Station Systems.—XIX."

In the general design of a feedwater main and its branches long-radius bends should be used rather than short, right-angle turns. In many cases it will be found possible to use bends instead of elbows. The long-radius bend shown in Figure 186—(D1-5) is preferable to an elbow fitting such as would ordinarily be used close to the boiler. Such bends afford more pliable connections which will better withstand expansion strains, and since they also offer less resistance the regulation of the flow of water to the boiler will be better.

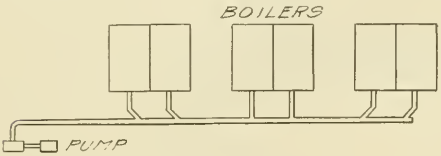


Figure 188-(D1-7).

The ideal method of securing a uniform flow of feedwater to all boilers would be to make the connections as shown in Figure 187—(D1-6). It is quite certain, however, that the improvement in operation would not justify the additional joints and parts and the attendant increased cost. To secure results that will compare favorably with those obtained with the arrangement shown in Figure 187 it is necessary to make the main, a, in Figure 186, of a size sufficient to enable about the same pressure to be maintained throughout its entire length. It is not necessary to run a large line between the pump and the first boiler branch from the feed main, but from the first boiler branch to the last one the pressure drop should be kept as low as possible. If the boilers are under 175 pounds steam pressure and the feedwater is under 180 pounds pressure at the first boiler connection and under 176 pounds pressure at the last boiler, then the available water pressure at the first boiler is four times that at the last boiler yet there is but a four-pound drop in pressure. The available pressure, which is the difference between the steam pressure in the boiler and the water pressure in the feed main should be kept as low as possible, thus permitting the line to operate with the feed valves well open.

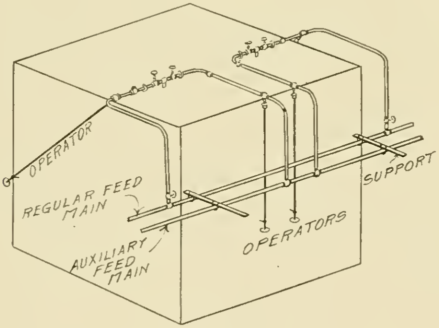


Figure 189-(D1-8).

The arrangement of boiler connections shown in Figure 188—(D1-7), would probably afford nearly uniform pressure at the different outlets of the feed main. The first two boilers would each have a wye outlet fitting turned as shown, so as to offer resistance to the flow of water through it, the resistance increasing with the flow. The wyes at the last two boilers would offer the least resistance and by using standard tees at the two center boilers, the resistance at this point would be intermediate to that of the two boilers on either side.

It will be noted in Figure 186 that the feed regulating valve is located at the top of the boiler. To avoid lowering the branch to a point which may be reached by the operators and then raising it to the top of the boiler, the valve is operated with an extension stem.

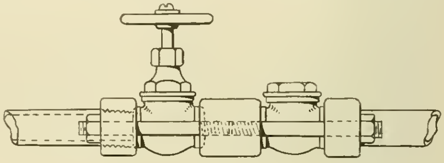


Figure 190-(D1-9).

The feed branches should be made as short as possible and at the same time should have sufficient length to allow for free expansion and contraction. With most installations of six or eight boilers this result can be obtained with about 8 or 10 feet of boiler branch.

Figure 189—(D1-8) shows a simple feed branch arrangement for a double system of feeding. The regular feed main has its operators carried down and placed close to the front of the boiler setting. The auxiliary feed operators at the rear setting are used only in case of emergency; the inconvenience found in operating them in this manner is too slight to require any more expensive arrangement. It will be noted that Figures 186 and 189 show branches taken from the tops of the feed mains. This arrangement is advisable wherever possible as it affords a ready means of discharging any air from the main that may be delivered by the pump. It will also be noted that there are two stop valves, a check and a regulating valve, for each branch. This arrangement permits the opening of the check valve at any time by setting the two stop valves. The feed-regulating valve should not be regarded as a shut-off valve as the nature of its service is such as to prevent its remaining in a condition to close tightly. The independent stop valves are necessary to admit of quick repairs to the feed valve. The stop valves should be of the gate pattern and the regulating valve of the globe or angle pattern.

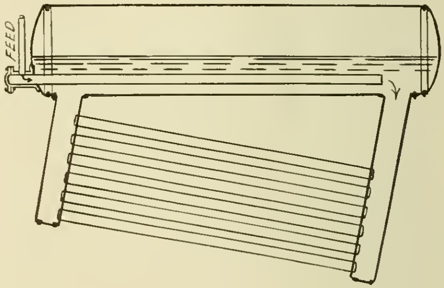


Figure 191-(D1-10).

Boiler Feedwater Valves.

It will be noted in the designs shown in Figures 186 and

189 that the regulating valves are turned with their stuffing boxes downward. This arrangement would be objectionable if used on the steam connection since it permits condensation to leak through the stuffing boxes. Valves used on water connections are as liable to leak at the stuffing boxes in one position as another. The objection to placing water valves with the stuffing boxes downward is that the heavier particles carried with the water will lodge in the bonnet of the valve and in valves of the gate pattern will prevent them from opening fully. This objection is not as marked with valves of the globe and angle patterns because the space that the valve disc opens into is in the path of the water flow and therefore no great amount of deposit can collect. This method is demonstrated by the many similar valves successfully operated in the reversed position.

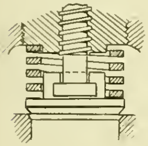


Figure 192-(D1-11).

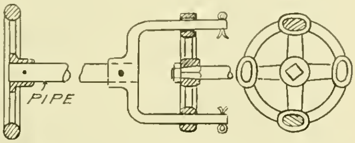


Figure 193-(D1-12).

In Figure 190—(D1-9) is shown a detachable feed-regulating and check valve made up as a unit. Since the joints between the valve and the flange are ground, the valve may be removed by simply loosening the nuts. This arrangement allows a valve to be removed for repairs and a spare one quickly substituted without shutting down the boiler. Feedwater should enter the boiler at a point considerably below the water line in order to prevent any portion of the feed branch from filling with steam, which would cause water hammer when the feed valve is again opened. In order to minimize the expansion and contraction strains it is advisable not to allow the feedwater to come in contact with the boiler until it has been heated to the temperature of the water in the boiler.

Figure 191—(D1-10) shows a feedwater tube arranged to discharge into the coldest part of the boiler. The nozzle attached to the drum has a blind flange which closes the end opening. The feed opening is at the side of the nozzle. As this tube is the same size as the boiler tubes it may be cleared of scale at the same time. As feed pipes quickly fill with scale they should not be run into the boiler without providing ample means for cleaning.

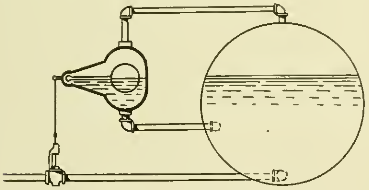


Figure 194—(D1-13).

In considering the details of feed-regulating valves it should be borne in mind that such valves are at all times but partly open. The valve disc of a globe valve is held firmly when the valve is entirely open or shut and therefore will not chatter. The steam throttle is not subjected to as severe service as a feedwater valve since steam is elastic and passes the throttle at a constant speed. The feedwater on the other hand passes the regulating valve intermittently, in unison with the pulsations of the pump, and is therefore constantly rocking the loose disc on the valve stem. A disc held as shown in Figure 192—(D1-11) will remain stationary on the stem, as it is held rigid by the spring top. The swing check valve having a flat-faced disc, opens and closes more quickly than the poppet type and though the swing type may not be quite as tight while new, it is more suitable for a boiler feed check since it retains a good face and guide much longer than the other type.

A regulating valve is seldom operated directly by the handwheel since the location of the valve is such as to invariably require an extension stem. In Figure 193—(D1-12) is shown a valve handwheel with an extension fork and a handwheel for the extension. The rod is of pipe pinned as shown and the handwheel on the regulating valve has openings in the rim to receive the operator fork. If the handwheel is not provided with holes the ends of the fork may be run through between the arms of the handwheel, which is the usual form of construction for valve extensions.

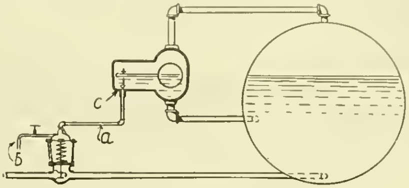


Figure 195-(D1-14).

There are a number of forms of automatic feed controllers designed to shut off the feed when the water in the boiler is high, and to open it when the water is low. Some are operated by floats and others by thermostats. The earlier form consisted of a float attached to a lever valve placed inside the boiler, the construction being very similar to that of a tank float valve. To overcome the objection to placing the device in such an inaccessible position the float was placed in an independent water column with a shaft passing through the stuffing box and operating the balanced feed valve as shown in Figure 194—(D1-13). An objection to this device is that hollow floats are very uncertain and to operate a regulating valve against the friction of two stuffing boxes would require a float of considerable size. The available power is very slight and it requires almost constant adjustment to keep the regulator in continuous operation. To overcome the difficulty encountered with large floats and the lack of available power the float is made small and without the stuffing box. Connection is made to a pressure feed valve as shown in Figure 195—(D1-14). This device has a further advantage in the location of the feed valve. This can be operated without regard to the position of the float since the connection, a, is run from the float to the valve. The waste, b, is open a sufficient amount at all times to relieve the pressure over the diaphragm when the small float valve, c, is closed and thus allows the feed valve to open.

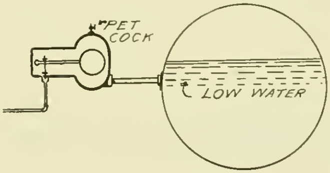


Figure 196-(D1-15).

To overcome the fluctuating movement of the float, float valve and feed valve caused by the constantly varying feedwater level, which variation occurs in any boiler worked approximately at its rating, the float chamber has been made with but the one connection as shown in Figure 196—(D1-15). This connection is placed at the low water level and when the water in the boiler reaches this point the float chamber empties its water back into the boiler. The float chamber then fills with steam and the float drops. When the water in the boiler rises and covers the connection the steam in the float chamber condenses, draws the water in and raises the float, thereby closing the feed valve.

It will be observed that a hollow float is used with the various types of feed regulators and that it is located inside a part of the boiler under pressure where it can neither be observed nor adjusted. To avoid the use of the float-controlled regulator the expansion-tube type has been introduced. One of the earlier forms was direct connected to the feed valve as shown in Figure 197—(D1-16). The brass tube is given a slight pitch (about 2 inches) and the compression bar, a, is made adjustable in length to allow for the closing of the feed valve when the water is at the desired elevation. The air cock, b, is placed in the steam branch in order to keep air out. As the regulator is dependent upon extreme temperatures it is necessary that the water in the brass pipe be as cool as possible and that the steam be of a high temperature. If air is allowed to accumulate in the steam tubes it will eventually reach the brass tube and by radiation cause the tube to drop in temperature to that of the water; therefore, it will be unable to raise the feed valve and admit water to the boiler. The regulator shown in Figure 197 and other direct-connected types including Figure 194, are defective because the valve disc is ordinarily held just off its seat. With the valve just raised from its seat and the pressure in the feedwater main enough higher than the boiler pressure to allow a sufficient quantity of feedwater to pass the valve, this difference in pressure soon causes a grooving of the valve and an increased inability to close tightly.

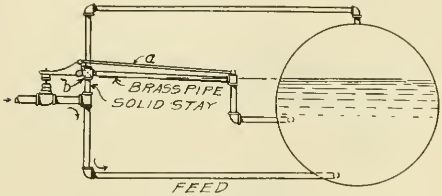


Figure 197-(D1-16).

The most successful regulating devices are those which use a pressure-operated feed valve as shown in Figure 195. This same method is sometimes employed with a thermostat controller, the thermostat operating a small valve that admits pressure to the feed valve. In Figure 198—(D1-17) is shown a thermostat controller of this type and it will be noted that the mechanism is entirely external. The expansion of the brass tube is opposed on one side by a rod which causes the end of the tube to raise and lower in accordance with its varying length. The pipe, a, to the feed valve is very small and the waste valve, b, is set to waste the water away by drops. The valve, c, is constructed to withstand a considerable wire-drawing through it. The details of this valve are shown in Figure 199-(D1-18). In many respects this type of regulator is free from the uncertain working parts contained in all the other forms here shown. The parts are sufficiently heavy to be handled safely by the attendants ordinarily employed in boiler rooms, which is not the case with some of the delicate thermostat arrangements that are attached to water columns. Automatic devices in a steam plant must withstand not only the severe use of regular operation, but also the abuse of the attendant. It is also necessary that a regulator be so designed that if the boiler should become cold or the diaphragm in the feed valve break, the feed valve will immediately assume the open position and flood the boiler rather than close and endanger life and property by running the boiler with low water. The arrangement shown in Figure 198 provides for these conditions in a satisfactory manner.

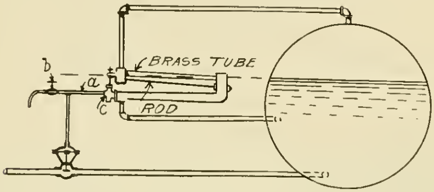


Figure 198-(D1-17).

Thermometer Cups.

Thermometers should be placed in the boiler feed mains at points where water enters and leaves the heater, where water leaves the economizer and also at least one at the point where the water enters the boiler farthest from the economizer or heater. It will not be found satisfactory to permanently locate thermometers at these different points, but provision should be made for holding a thermometer tube at any of them so that the tubes may easily be interchanged and accurate temperature readings obtained.

An inexpensive method for obtaining accurate temperature readings is to place mercury pots fitted with caps that may be screwed on by hand at the different points where temperatures are taken, as is shown in Figure 200-(D1-19). The openings for the thermometers should be tapped in a tee or ell where there is a considerable thickness of metal and where the area is greater than that of the pipe. This will avoid reducing the cross section of the pipe and impeding the flow. To hold the mercury there should be inserted in the hole a ¼-inch steel nipple with a thread at its upper end long enough to allow a cap to be screwed over it. The lower cap and the bushing should be of brass, the bush being ¼ to ½ inch. These dimensions will permit the lower cap to pass through the tapped opening. The use of the small nipple requires but a small amount of mercury to cover the thermometer bulb. The mercury standing in the well will have the same temperature as the water in the pipe and readings can be taken soon after placing the thermometer.

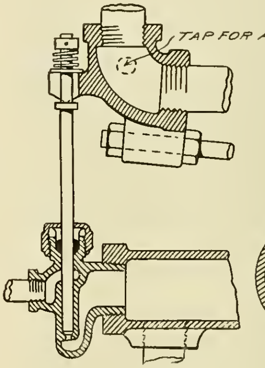


Figure 199-(D1-18).

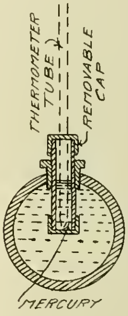


Figure 200-(D1-19).

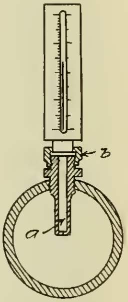


Figure 201-(D1-20).

If the thermometer is to remain in place a more suitable arrangement is as shown in Figure 201-(D1-20). The thermometer here shown is of standard design. It has a metal case which is attached to the well with a knurled union, b, and its bulb is in the tube, a. There should be as many wells as there are points where the temperatures are to be taken and a little oil should be placed in the well before inserting the thermometer. A cap is furnished with each well to protect it from dirt and damage to the thread.

(To be continued.)

NEWS SECTION

GENERAL NEWS OF THE MONTH

Programme for the Columbus Convention.

Secretary Swenson of the American Street & Interurban Railway Association has recently announced a partial list of the titles and authors of the papers to be read at the Columbus convention in October. The list as decided upon up to August 7, 1906, is as follows: "Uniforms and Badges," by John R. McGivney, purchasing agent New Orleans Railways & Light Company, New Orleans, La.; "Handling Public Complaints," by John A. Beeler, vice-president and general manager Denver City Tramway Company, Denver, Col.; "Interurban Freight and Express," by E. C. Spring, general manager Dayton Covington & Piqua Traction Company, West Milton, O.; "Interurban Limited Trains," by Harrie P. Clegg, president, Dayton & Troy Electric Railway Company, Dayton, O.; "Discipline of Trainmen," by F. W. Brooks, assistant general manager Detroit United Railway, Detroit, Mich.; "Leaks Between Passenger and Treasurer," by A. H. Stanley, general superintendent Public Service Corporation of New Jersey, Newark, N. J.; "Selection of Trainmen," by C. E. Learned, superintendent of inspection Boston Elevated Railway Company, Boston, Mass.; "Tickets and Rates," by F. W. Coen, secretary and treasurer Lake Shore Electric Railway Company, Cleveland, O.; "Young Men's Christian Association Branches," by E. M. Willis, railroad secretary International Committee of the Young Men's Christian Association, 3 West Twenty-ninth street, New York; "Electric Railways in Sparcely Settled Communities," by E. P. Roberts, Roberts & Abbott Company, Cleveland, O.; "Some Distinctions Between City, Suburban, Interurban and Railroad Traffic," by Theodore Stebbins, expert for the National Civic Federation, Columbus, O.

Programme for Columbus Meeting of Accountants' Association.

President Brockway has announced the following programme for the Columbus session of the American Street and Interurban Railway Accountants' Association:

TUESDAY, OCTOBER 16, 1906, 10 A. M. TO 12.30 P. M.

Call to order.
Address of Welcome by P. V. Burington, Secretary Columbus Railway & Light Company, Columbus, O.
Address by Hon. W. Caryl Ely, President American Street and Interurban Railway Association.
Address by B. V. Swenson, Secretary American Street and Interurban Railway Association.
Annual Address of President W. B. Brockway.
Annual Report of Executive Committee.
Annual Report of Secretary and Treasurer E. M. White.
Appointment of Convention Committees.

TUESDAY, OCTOBER 16, 1906, 2 P. M. TO 5 P. M.

Paper—"The Accounting of Capital Expenditures," by P. S. Young, Comptroller Public Service Corporation of New Jersey, Newark, N. J.
Question Box.
Convention Photograph.

WEDNESDAY, OCTOBER 17, 1906.

Morning in joint meeting with other associations.

WEDNEDAY, OCTOBER 17, 1906, 2 P. M. TO 5 P. M.

Paper—"The Use of Curves in Statistics," by A. Stuart Pratt, General Auditor and Treasurer Stone & Webster Companies.
Report—Committee on Standard Classification of Accounts.
Election of Officers.

WEDNESDAY, OCTOBER 17, 1906, 8 P. M.

Informal reunion and dinner.

THURSDAY, OCTOBER 18, 1906, 10 A. M. TO 12.30 P. M. AND 2 P. M. TO 5 P. M.

Review—"Depreciation as Applicable to Electric Railways," by Robert N. Wallis, Treasurer Fitchburg & Leominster Street Railway, Fitchburg, Mass.
To be followed by discussion. This meeting will be an executive session.
Installation of Officers.

The Fort Dodge Des Moines & Southern Interurban.

The contract for the electrical equipment of the Newton & Northwestern Railroad, which will form a part of the Ft. Dodge Des Moines & Southern Interurban Railway from Des Moines to Ft. Dodge, Ia., has recently been awarded to J. G. White & Co. of New York. The Newton & Northwestern is a steam road running from Newton, Ia., in a northwesterly direction to Rockwell City, Ia., a distance of 102 miles. Des Moines is located 25 miles west of Newton. Branches from the Newton & Northwestern will be built, one from a point east of Gowrie to Ft. Dodge, and another from a point 3½ miles east of Kelley to Des Moines. The branch lines to Ft. Dodge and Des Moines will be electrically equipped, together with that portion of the main line lying between Kelley and Gowrie. A branch line will also be built from Kelley to Ames, where the Iowa Agricultural College is located.

The total length of the line to be electrically equipped is about 90 miles. Current will be supplied from a power house located at Fraser, which is about midway between the terminals. Coal is to be obtained at a low cost from mines adjacent to the power house. The power house will be of brick and steel construction and will contain three 400-horsepower boilers, two 1,250-kilowatt Westinghouse-Parsons turbines and the necessary electrical apparatus. The current will be transmitted at a pressure of 20,000 volts to five substations, where it will be transformed into direct current and fed to the trolley.

Heavy cars of a modern type, 53 feet long, and weighing about 40 tons, will be used. They will be provided with four 75-horsepower motors, and will be operated at a speed of from 45 to 50 miles per hour. Hourly service will probably be provided between Des Moines and Ames and between Des Moines and Boone, and a two-hour service between Des Moines and Ft. Dodge. It is expected that the line will be in operation by January 1, 1907.

The Ft. Dodge Des Moines & Southern will also operate the Ames & College Railway and the street railway system in Ft. Dodge. The cars will enter Des Moines over the tracks of the city system and will have a freight and passenger terminal in Ft. Dodge.

President Winter's Defense of 10-Cent Fares to Coney Island.

On July 13 the State Board of Commissioners of New York listened to an argument upon, and took under advisement, an application of President Coler of the Borough of Brooklyn for an order compelling the Brooklyn Rapid Transit Company to carry passengers to Coney Island for a 5-cent fare instead of 10 cents, the present rate. Because of the very heavy travel of working people to Coney Island and the consequently large number who would avail themselves of a cheaper outing rate; and because of the existence in Brooklyn, as in other crowded quarters, of a feeling of irritation against the street railway company there is sufficient popular approval of the borough president's course to make the case of great interest to the Brooklyn public. This interest was intensified by a hearing on July 25, in the appellate division of the supreme court of the state on a writ of habeas corpus brought on behalf of Dr. T. J. MacFarland, a citizen who was arrested on July 24 for refusing to pay double fare between Brooklyn and Coney Island. Attorneys for Dr. MacFarland based their plea on the argument that the extra fare was illegal. The counsel for the Brooklyn Rapid Transit Company declared that the arrest was made without the knowledge of the company by a detective who was a friend of Dr. MacFarland and as the result of a conspiracy to bring the case before the public in the worst possible light; that the company had instructed its men not to have patrons who refused to pay the extra fare arrested, but to eject them from the car; and the company should not be forced to defend its 10-cent fare in a proceeding based on an incident for which it was not responsible. The case was taken under advisement.

In the hearing before the state commission President E. W. Winter of the Brooklyn Heights Railroad Company gave a concise review of the whole subject from the standpoint of the companies involved. As this statement contains matter of seemingly general interest it is presented herewith:

Referring to its verified answer to the complaint of the president of the Borough of Brooklyn against the charge of more than 5 cents to Coney Island, the Brooklyn Heights Railroad Company herewith begs leave to submit a general statement setting forth the material facts bearing upon the operation to Coney Island of its cars and those of other companies of the Brooklyn Rapid Transit system mentioned in the complaint.

The cars of all of these companies operating to that terminus proceed thither and depart therefrom over what were formerly steam railroad lines owned by companies incorporated under the general railroad act of 1850, under which a fare of 3 cents per mile always has been and still is authorized to be charged. None of the companies collects the second fare except upon those old steam railroad lines.

The companies mentioned in the complaint are all street surface railroad corporations and neither these companies nor any other street surface railroad corporations leased to or merged with such companies own now or ever have owned any street railroads to Coney Island.

The Brooklyn City Railroad Company, which is leased to the Brooklyn Heights Railroad Company, and which is the oldest and has been the most profitable street railroad company in Brooklyn, has never owned a Coney Island line and has never sought to obtain one. This fact is mentioned to show that the Coney Island traffic has not been sufficiently profitable to encourage investment of capital in extensions of street surface railroads to Coney Island. The four steam railroad lines over which traffic from street surface and elevated railroads is now carried to Coney Island reach that resort from points which a few years ago were on the southern outskirts of the built-up portion of Brooklyn over private rights of way, most of which are owned in fee, that fee having been acquired at large expense from private property owners, and the right to operate thereon being dependent on no municipal favor or privilege except as the tracks crossed the few highways then opened for public use. Their situation was similar in every respect to that of other steam railroad companies constructing and operating railroads through country districts pursuant to the provisions of the general railroad act of 1850.

The history of each of these four steam railroad lines prior to their acquisition or operation by street surface or elevated railroad companies operating in the built-up portion of the former City of Brooklyn is a history of failures, foreclosures, and reorganizations. These four lines are property of what are now or were formerly known as the Brooklyn Bath & West End Railroad Company, the Sea Beach Railway Company, the Prospect Park & Coney Island Railroad Company and the Brooklyn & Brighton Beach Railroad Company.

Under the operation by steam of these old railroad lines, the authorized fare was 3 cents a mile and the charged fare from their termini on the outskirts of the built-up portion of Brooklyn to Coney Island was not less than 10 cents, and during part of their operation considerably more than 10 cents and that amount, added to the fares necessary to reach these lines over the street surface and elevated lines of Brooklyn and over the Brooklyn Bridge, made charges of from 18 to 25 and 30 cents and upwards from various parts of Brooklyn and from Park Row, New York, to Coney Island. The passenger service was infrequent and the equipment and roadbeds were inferior.

The passing of control of these steam railroad lines to street surface and elevated railroad corporations operating principally in the old City of Brooklyn was signalized by the entire reconstruction of these steam railroads as electric railroads; the rebuilding and surfacing of their tracks and rights of way; the physical connection of their tracks with those of the street surface and elevated railway system; the addition of large numbers of new cars; the construction of new terminals; the reduction of fares to 10 cents from all parts of Brooklyn and from Park Row, Manhattan, and a very much increased car service. Instead of cars operated on a headway of seldom less than 20 minutes and often of one hour, cars are now operated to Coney Island on 19 lines and on headway as low as three minutes.

From the acquisition of these routes to Coney Island and the expenditures thereon of very large sums of money in improving track and power facilities, terminals and car service the companies have up to the present time received no commensurate return and their only reliance for profit is upon the building up of intermediate territory between the old portion of Brooklyn and Coney Island Beach. The Borough of Brooklyn and the City of New York, on the other hand, and their people have been very large beneficiaries of that acquisition and expenditure. During the 10 years through which this period of railroad acquisition and development has continued, the population in the two outlying wards, namely, the 30th and 31st, through which these steam railroads extend to Coney Island, has nearly trebled; the number of buildings annually constructed has nearly trebled and the assessed valuations have increased from $17,257,397 to $61,736,472, an increase of $44,479,075 or over 250 per cent. In other words, the City of New York at the tax rate of last year is receiving in its treasury $694,763 this year additional taxes as a result primarily and almost exclusively of the improvement in transportation facilities which has followed the acquisition of these old steam railroad lines by the Brooklyn Rapid Transit system.

Very little of this growth and development would have occurred had it not been for what is called the Coney Island business. The fame of that resort and the large number of people carried to it under electric operation and the frequency of the car service required to conduct such large numbers of passengers have been and are a tremendous boon to the vast undeveloped farm lands between Greenwood Cemetery and Coney Island Beach. To enforce a rate of fare which compels the carrying of passengers at a loss is not only confiscatory and illegal, but would necessarily result in diminishing the facilities afforded and cause a serious retrogression in the great development which is now going on in its outlying territory.

From the business point of view of the railroads the Coney Island traffic is and always has been an exaggerated source of income. As its history conclusively proves transportation under independent steam operation was a succession of financial failures. Under electric operation and by the superior facilities offered by through service from the Borough of Manhattan and all parts of Brooklyn, the gross revenue has been very largely increased, but the net revenue, if any, has been insignificant. Merged as the operation of the Coney Island lines is with operation of lines of the same companies in the built-up territory of the Borough, it is impossible, accurately and absolutely, to determine the loss or gain attributable solely to the Coney Island business. Such evidence as is at hand, however, confirmed by close observation and railroad experience, indicates clearly that not only is there no great profit in carrying passengers to that resort for a fare of 10 cents, but that a reduction of that fare to 5 cents would result in such great losses as to compel the companies, if possible, to abandon that feature of their business.

The length of the principal routes to Coney Island is upwards of 12 miles, which is less, without considering transfers, than a cent a mile per passenger. When it is considered that nearly all of this excursion business is chiefly what may be called one-way traffic—the business during part of the day being towards Coney Island and during the remainder of the day from Coney Island—the cars and trains in effect must make 24 miles for a single fare of 10 cents or about .4 of a cent per mile, this low rate being increased by whatever local fares might be taken in on the trip. Moreover, the Coney Island business is limited to four months in the year, during those four months principally to Sundays and holidays, and during the rest of the year the service must necessarily be much greater than the business requires, resulting in actual loss in operation. In spite of the fluctuating nature of this Coney Island business and the limited period through which it extends, the handling of it requires the maximum expenditure of power, cars, train service and maintenance, strains to the utmost all the facilities of the companies and the efforts and energies of their employes, and has, by the superior attraction of the sea and the more comfortable and speedy means of access to it, changed materially the trend of pleasure travel, so that instead of the holiday trolley business being confined, as it used to be, to pleasure resorts within or near the built-up portions of the city, the great current of pleasure riders now is over the Coney Island routes where the comparative expense of carrying is much greater proportionately than the increased fares received.

When all these facts are considered the companies make small, if any, profit in carrying passengers to Coney Island for 10 cents and materially to reduce that rate would subject them to great losses. When the Nassau Electric Railroad Company acquired the Brooklyn Bath & West End Railroad Company and leased the Coney Island & Gravesend Railway Company for a time it carried passengers to Coney Island for 5 cents, but that operation was notoriously unsatisfactory to the public and resulted in losses which led to the financial reorganization of that corporation. The fare of 10 cents is not only legal, but is reasonable and compares favorably with similar charges anywhere else in the world on exclusively pleasure routes. It imposes no hardships on any class of people and is in striking contrast with the charges for admission to places of resort on Coney Island when the comparative cost of the service and entertainment is considered. The point of collection of the second fare has been purposely placed sufficiently distant from the built-up portion of the city to encourage the development of the unbuilt-up sections, in pursuance of our well demonstrated policy to give the benefit of a 5-cent fare to all the residence portions of the Borough of Brooklyn. Not only would the abolition of the additional fare to Coney Island serve no public purpose, but it would make impossible for the companies the continuance of their liberal expenditures for the development of their facilities in these outlying districts and thereby be an actual injury to public interests.

The Chicago Lake Shore & South Bend Railway.

J. G. White & Co., of New York, has completed estimates and surveys for an electric railroad, 70 miles long, from South Bend, Ind., to the Illinois-Indiana state line in the city of Hammond, to be known as the Chicago Lake Shore & South Bend Railway. It is reported that the road will be financed by the Transit Finance Company, of New York, and it is expected that the line will be completed by the Illinois Central from Hammond northwest into Kensington, there making connection with the Central tracks for a continuous route into Chicago. The Illinois Central is bound by traffic agreements not to build east of the state line, which accounts for the rather unusual construction conditions.

From Hammond the new road will run eastward into Gary. From Gary east to Dunne Park the line will practically parallel the tracks of the Lake Shore & Michigan Southern Railroad, and from Dunne Park to Michigan City it will lie between the tracks of the Michigan Central and the shore of Lake Michigan. The route is almost straight east from Michigan City to South Bend, a distance of about 30 miles.

It is anticipated that a steamer service from Michigan City to Chicago will be run in connection with the road, giving the residents in the district from Michigan City to South Bend inclusive a convenient route into Chicago. The road will be equipped for both passenger and freight traffic, and it is at once apparent that it will be thrown into direct competition with the steam roads in the district. It is not as yet determined whether the line will be single or double track.

The construction will conform to the best interurban standard and the track will be laid with 75-pound rails. All bridge structures, except a bridge over the Calumet river, will be of concrete or steel, and two trolley wires will be included in the overhead equipment. In case the single-track road is decided upon, eight sidings, each 2,700 feet long, will be provided. On 85 per cent of the road the grade will not exceed two-tenths of one per cent and the usual maximum for overhead crossings will be two per cent. At two points, however, the grade on these bridges may run five per cent. As approved, the total curvature for the line amounts to 1,034 degrees, divided between 59 curves, practically all within the city limits of the various towns en route.

Cleveland Traction Situation.

On July 24 at the meeting of the city council the Cleveland Electric Railway and the new Municipal Traction Company which has leased the Forest City Railway Company, brought their respective propositions definitely before the public. The Cleveland Electric Railway applied for permission to extend its lines on 27 different streets and introduced an ordinance granting an extension of its present franchises for 25 years, agreeing in return to sell seven tickets for a quarter with universal transfer privileges and to build new lines, elevated roads and subways as the city may direct. The company asked that the matter be submitted to a vote of the people and offered to pay the expense of an election. The Municipal Traction Company offered a parallel proposition asking that it also be submitted to a vote. Its offer included taking over the Cleveland Electric franchises as they expired, a three-cent fare, universal transfers, franchises to be terminated by the council at any time, council to have power of regulating service and ordering extensions, capitalization $50,000 per mile with but 6 per cent dividend, and road to be sold to city at any time when it shall vote for municipal ownership. Both propositions were referred to a committee and an ordinance asking for an election will probably be introduced at the next meeting of the council. On the morning of July 25 a large force of city employes under the direction of Mayor Johnson and Director of Public Works Springborn, tore up the tracks of the Cleveland Electric Railway Company on Fulton road from Lorain avenue to Franklin circle and laid them to one side of the street to make room for the tracks of the Forest City Railway on the other side. This proceeding was based on a resolution passed by the council on June 11 after a franchise had been given the Forest City company for a track at one side of the street, ordering the Cleveland Electric Railway to remove its tracks from the center of the street to the other side within 30 days. The company denied the legality of the order and paid no attention to it until the mayor took the matter into his own hands. The Cleveland Electric company immediately secured an injunction against the city authorities which was served at 11:20 a. m. The mayor, pretending that he did not know what he was enjoined from doing, gave orders to continue the work during the afternoon, and the Forest City company began laying its track, until the court ordered all work to be stopped and commanded Mayor Johnson and Director Springborn to appear next morning for contempt of court. The case was then postponed until July 31 to give time to prepare a defense and on August 3 the court decided that Mayor Johnson was not guilty of contempt. Director Springborn was fined $100 and costs.

Municipal Street Railway Commences Operation.—The first car on what is said to be the first American municipally owned and operated electric street railway was put in operation in Monroe, La., on July 11.

New Passenger Station for Illinois Traction System.—The Illinois Traction System will, about August 15, begin occupying as a passenger station the building at Eighth and Monroe streets, Springfield, Mo. The lower floor of the building will be used for the handling of the company's freight and passenger business, and the upper floor will be occupied by General Traffic Manager B. R. Stephens and his assistants.

West Penn Trolley Trips.—The transportation department of the West Penn Railways Company has recently issued a folder styled "Tips on Trolley Trips." The folder contains illustrations of some of the company's rolling stock and right of way, schedules, information regarding special cars and a map of the line.

Six Tickets for a Quarter in Philadelphia.—The Philadelphia Rapid Transit Company on August 1 placed on sale its new package tickets, at the rate of six for 25 cents. The tickets are printed on buff-colored cardboard, six to a sheet, with perforations so that they can be torn off as used. The new tickets met with favor by the traveling public.

Express Service Between Springfield and Bloomington.—The Illinois Traction System on August 1 installed an express service on its lines from Springfield to Bloomington, via Decatur. Trains leave from both ends of the line simultaneously at 12 M. Similar service is in operation on other lines of the company, eight express cars and twenty trailers being used.

United Railways Company (St. Louis, Mo.)—The stockholders on August 8 ratified the proposition of the directors to absorb the St. Louis & Suburban Railway on the basis of an exchange of stock. At the same time the stockholders of the St. Louis & Suburban met and voted to accept the offer. This merger gives the United Railways control of all the street railways of St. Louis.

To Test Rights of Steam Road to Acquire Trolley Roads in Massachusetts.—Governor Guild of Massachusetts has directed Attorney-General Malone to put the legal machinery of the commonwealth in motion to investigate the validity of the action of the New York New Haven & Hartford Railroad in acquiring control of the stocks of Massachusetts electric railways, through the medium of a holding corporation, the Consolidated Railway Company.

Chairman of Accountants' Association Committee Appointed.—President W. B. Brockway of the Street Railway Accountants' Association has appointed H. J. Davies, secretary Cleveland Electric Railway Company, chairman of the association's committee on "International Form of Report." The other members of the committee are W. G. Ross, managing director Montreal Street Railway Company, and F. E. Smith, auditor Chicago Union Traction Company.

Free Uniforms for Employes.—Beginning with July of this year the Topeka Street Railway Company of Topeka, Kan., will every year furnish two new uniforms to each of its employes who has been in its service for 10 years or more. One new uniform will be furnished to each employe who has been in the company's service for more than five years and for less than 10 years. This arrangement offers a considerable inducement to the employes to remain with the company.

A Recently Patented Street Car Fender.—A patent has been taken out by W. S. E. Sevey, of New Orleans, La., upon his recently invented street car fender. The fender is designed to fold back against the dash board of the car and is dropped into position on the track by means of a spring and a lever which is operated by the motorman's foot. Since the fender, when not in use, is out of the way it does not interfere with the coupling of cars. There are two side guards which are fixed in position and prevent objects from getting under the wheels from the side. The inventor estimates that the fenders can be made and attached in the factory at a cost of $5.00 each.

Two and a Half-Cent Car-Fare Agreement in Detroit.—Mayor George P. Codd, of Detroit, Mich., and J. C. Hutchins, president of the Detroit United Railway, have agreed on an ordinance by which in consideration of the extension for 15 years of the company's franchises which expire in 1909, the Detroit United Railway agrees to sell ten tickets for a quarter for use between 5 and 8 a. m., and 4:30 and 6:30 p. m., and six tickets for a quarter for use at other times. Universal transfers are to be granted on all lines at all hours; the street railway company is to pay for all paving between the tracks; and is to pay to the city a 2 per cent tax on its entire gross earnings. At the expiration of the franchise the city is to have the right to purchase the lines. The ordinance is to be submitted at once to the city council and to the people at the November election.

Private Car for Illinois Traction Officials.—President W. B. McKinley and General Manager L. E. Fischer of the Illinois Traction System are planning a private car for their exclusive use, which it is said will be one of the handsomest cars in use on any of the electric lines in the country.

Niagara Power for Syracuse Street Cars.—On July 31 all the cars of the Syracuse Rapid Transit Company were operated experimentally by electric power from Niagara Falls, 150 miles away, supplied by the Niagara Lockport & Ontario Power Company. The test was entirely successful and it is said that the change from the old power to the new was made so smoothly that the motormen did not notice it. It will be some time before the new power is used permanently.

Club House for Employes of Portland Railway Light & Power Company.—President Goode, of the Portland Railway Light & Power Company, of Portland, Ore., has announced, that a club for the employes will be established as soon as a suitable location can be found. Plans are now being prepared and it is expected that the apartments will be supplied with all the appointments of a modern club. Social features are to be developed and a lecture course provided. It is expected that the membership will include over 1,000 employes.

A Graphic Bulletin Columbus as a Center.—A third convention bulletin was lately issued by Secretary Swenson of the American Street & Interurban Railway Association. It is in the form of a circular map representing the territory within a radius of 500 miles with Columbus, O., the convention city for the October meeting of the association, as the center of the map. It may be readily seen that the section of the country represented includes most of the largest cities in the United States, a fact that promises a full attendance at the meeting of the convention in October.

Connecticut Trolley Roads Carry More Passengers Than Steam Roads.—According to the annual report of the railroad commissioners of Connecticut the electric roads carried over 50 per cent more passengers during the year ending December 31, 1905 than the steam lines. The steam roads carried 64,403,149 passengers and the trolleys 102,849,160. The steam roads injured 790 persons, 184 fatally, while the trolleys injured 465, 28 of them fatally. The total stocks, bonds and floating debts of the trolley companies amounted to $68,048,532, an increase of $12,641,252 over the previous year.

An Attractive Industrial Folder.—The Lackawanna & Wyoming Valley Railroad, the third-rail line connecting Scranton and Wilkesbarre, Pa., has recently issued an illustrated industrial folder, calling attention to the numerous desirable sites along the line for the location of industrial enterprises. The folder contains considerable information regarding the history and development of the road and a number of views of the company's property and several manufacturing plants along the line. A very complete map of the system is shown on which the locations available for industrial purposes are plainly marked.

Pittsburg Railways to Check Electrolysis by Bonding.—The electrolysis evil is to be attacked in a systematic manner by the Pittsburg Railways Company in an effort to eliminate a portion of the danger to the water and gas mains in the Pittsburg streets. The mains will be bonded to each other in much the same manner as the track rails and provision will be made for returning the stray current to the rails by means of bonds spaced at suitable intervals. E. E. Brownell, the Chicago expert, who made the examination of the pipes is dividing the city into sections and it is expected that work will be commenced shortly.

Express Steamers for Lake Traffic.—The Twin City Rapid Transit Company is distributing a folder containing illustrations and descriptions of the six express boats which the company operates on Lake Minnetonka. These boats were built in the Minneapolis shops of the Twin City Rapid Transit Company and are all new this season. They present a very pleasing appearance and are all well fitted and equipped. The boats furnish connection at frequent intervals between Excelsior, which is the terminal of one of the Twin City interurban lines to the lake, and all the principal landings on upper as well as lower Lake Minnetonka.

Lake Shore & Michigan Southern's Private Trolley Line.—The Lake Shore & Michigan Southern Railroad is constructing a private trolley line in its freight yards at Collinwood, O., for the purpose of carrying switchmen and other employes to and from different points in the yard. As the Collinwood yard is what is known as a "hump" yard, a switchman rides each car down the grade to govern its speed. It is to carry these switchmen back to the starting point of the cars that this electric line is being built and the officials feel that the time lost by the men in walking back to the starting point has been so great as to justify the installation.

Court Approves New York Rapid Transit Routes.—The appellate division of the supreme court of New York has approved the plans of the Rapid Transit Commission for 19 different extensions of the subway system, running in every direction through Manhattan and the Bronx, but with the provision that only such of these routes as the commission may determine upon and contract for within the next two years shall have final approval. As the total cost of the 19 routes for building and equipment is estimated at $450,000,000 and as the city's legal borrowing margin on January, 1906, was only about $61,000,000, it is evident that all of the routes cannot be built, but the Rapid Transit Commission is left to decide which ones are most important and should be constructed at once, and may later make further applications from time to time for additional routes.

New Offices for the Portland Railway, Light & Power Company.—The offices of the traction, light and power companies forming the Portland Railway Light & Power Company will be moved in a few days to the building at the Northeast corner of First and Alder streets, Portland, Ore., now occupied by the Oregon Water Power & Railway Company. The entire three floors will be used and the two upper floors of the building adjoining have also been leased. The various departments of the company will have their headquarters here only temporarily, as it is the intention of the company to erect a large building of its own within the next two years.

United of Baltimore Increases Wage Scale.—In view of the efficiency and loyalty to the company shown by the motormen and conductors of the United Railways & Electric Company of Baltimore, Md., particularly during the period which followed the fire of February, 1904, the company has authorized a substantial increase in the wages of its trainmen. The advance is approximately 3½ cents per hour and was effective on July 11. In discussing the matter General Manager House said that the employes of the company have been very loyal to its interests. Many of them had opportunities to leave the city after the fire, but remained with the United despite its crippled condition.

The New York City Railway Staff Entertained at the Home of President Vreeland.—On August 1 President H. H. Vreeland, in accordance with his yearly custom, entertained the officers and staff of the New York City Railway Company and a number of invited guests, including railway officials and the officers of the New York Railroad Club, at his country home at Brewster, N. Y. The party went to Brewster in special cars over the Harlem division of the New York Central and was accompanied by a bugle, fife and drum corps composed of employees of the New York City Railway. They were welcomed at the station by President Vreeland and were taken to the grounds of the Tonetta Outing Club, where a Rhode Island clam bake was served. Later the visitors were served with a luncheon at "Rest-a-While," the summer home of Mr. Vreeland and family.

Northern Ohio Traction Plans Connection of Cleveland and Pittsburg.—The Northern Ohio Traction & Light Company is reported to be back of a movement that will eventually result in the connection of Cleveland, O., and Pittsburg, Pa., by an interurban electric line. The company is said to be already acquiring properties south of Cleveland and when the Canton-Akron system has been formally taken over a line from Cleveland to Alliance will be assured. A line from Alliance to Salem, O., is in operation and the Youngstown & Ohio River Railway is building from Salem through Lisbon to East Liverpool. The East Liverpool Traction & Light Company is building from Steubenville to Midland, Pa., and from the latter point the Pittsburg Railways Company is arranging for the construction of an extension to Coraopolis, Pa., where a connection is to be made with the present terminals of the company west of Pittsburg.

New York Subway Accident.—On July 22 a peculiar accident occurred on the express line in the New York subway which caused considerable damage and blocked traffic for over an hour. A five-car train from Fulton street, carrying about 100 passengers, was rounding the curve from Fulton street to the Brooklyn Bridge station when the second car left the rails, carrying with it the three cars behind, and swung against the steel pillars which separated the train from the adjoining tracks. The motorman applied the brakes but was unable to bring the train to a stop until the cars had cut furrows in the roadbed. None of the passengers was injured and they were allowed to walk back to the Fulton street station. The current was immediately turned off on all tracks below 18th street, thus blocking all local traffic below that station. Traffic on the express line was interrupted for about an hour and a half and on the local line for about an hour.

Chicago Traction Developments.—At a meeting of the committee on local transportation of the Chicago City Council on July 15, President Mitten of the Chicago City Railway and General Counsel Gurley for the Union Traction Company, promised to submit to the committee on September 15 the valuations of the intangible property of their respective companies, the valuations to be given in lump sums instead of in itemized form as the committee wished. During the summer the city's consulting engineers, assisted by 16 assistants, will be engaged in preparing their valuation of the tangible property, so it is expected that when the council meets again on September 24, the question of valuation will be ready for action. On July 22 electric cars began running on the State street line, previously operated by cable, from Sixty-third street to the down-town loop district. The running time was cut down from 50 minutes to 40 minutes. On July 23 contracts were let by the receivers of the Chicago Union Traction Company for lowering the three tunnels under the Chicago river, to John P. Agnew for the tunnel under La Salle street; Angus Brothers & Co., for the Washington street tunnel, and the Great Lakes Dredge & Dock Company for the Van Buren street tunnel. The contracts stipulate that all obstructions to navigation shall be removed before the opening of navigation in 1907. The board of tax review on July 27 failed to assent to the request of Corporation Counsel Lewis that higher assessments be made against the street railway companies and reduced the valuation of the Union Traction Company's personalty from $10,925.000 to $8,484.809, as scheduled by the company's officials. The Consolidated Traction Company's schedule was reduced from $3,501,096 to $1,763,195, and the valuation of $9,425,000 placed on the personalty of the Chicago City Railway was confirmed. The suit to test the legality of the issue of $75,000,000 of Mueller law certificates will be argued before Judge Windes of the appellate court on September 3.

United Railways of Baltimore Plans Improvements.—The plan for refinancing the United Railways & Electric Company of Baltimore, Md., to aid in making extensions and improvements was recently submitted to the directors of the company and unanimously adopted. The plan in brief is as follows:

Coupons on the income bonds to be refunded into a five per cent 30-year bond to December 1, 1910, cash payments then to be resumed. Seven million dollars to be spent to further develop the railways, of which $4,000,000 will be raised by a bond issue on new property. The whole bond issue, aggregating $8,000,000, to be based on the property of the Maryland Electric Railway Company, which is to be consolidated with the Baltimore & Annapolis Short Line road. Alexander Brown & Sons of Baltimore have been named fiscal agents by the United to represent it in the deal. The plan has been approved by the many interests seeking to guard the income-bond situation.

Interurban Electric "Railways" Are "Railroads."—A propertyholder sought to enjoin the county treasurer from extending the subsidy tax voted to the Winona Interurban Railway, in Indiana, on the ground that the vote was illegal because the electric railway was not a "railroad" under the intent of the state law. Judge Carter of Indianapolis, sitting as a special judge in the court at Warsaw, sustained the demurrer of the interurban company and held that the subsidy voted was legal. Judge Carter said the entire question to be settled was whether or not the act of 1903, defining the meaning of the word "railroad" in the act of May 12, 1869, was valid. There is no record, he said, where any supreme court has held that the word "railroad" refers to steam lines alone, and in his opinion it meant what the general acceptance of the term is—railroads of any description—and that it must be conceded that interurban electric railroads are railroads in the general sense of the word. This decision is of great importance in Indiana and other states and if it is sustained by the Indiana Supreme Court, to which it will doubtless be appealed, it will settle a question upon which the further construction of electric lines will depend in considerable measure.

Seattle to Vote on a Municipal Street Railway.—R. H. Thompson, city engineer of Seattle, Wash., in accordance with a request made about three months ago, has submitted to the city council a report recommending a municipal street railway system, of elevated, subway and surface lines, in addition to the present system of the Seattle Electric Company, to cost $7,579,940. Fourth avenue is suggested for the main line. The plan proposes to divide the cost of construction, issuing $1,272,000 of bonds to build the first 20 miles, the remainder of the bonds to be issued against the earnings of the system. Twenty-two routes are covered in the report, one a subway up Third avenue from Washington street to Stewart street, thence to Westlake boulevard and thence to Blanchard street, where it is proposed to bring the line to the surface. The present population of Seattle is estimated at about 176,000 and the present street railway mileage is 101 miles, thus giving .56 miles for each 1,000 of population. After examining figures for other cities, Mr. Thompson estimates that Seattle should have .7 miles of line for each 1,000 of population, or 124 miles at present, and that at the present rate of increase of population it should have 350 miles of track in 1924. The proposition is to be submitted to the people at an election on September 12.

Interurban Activity in Indiana.—The American Engineering Company of Indianapolis has recently issued an electric railway map of Indiana which illustrates the progress during the last six months of the interurban industry in the state. In comparison with a similar map issued six months ago, it is shown that 220 miles of electric road have been put into operation since January 1, 1906, and that construction work has been commenced on almost 400 miles additional. The new lines which have begun operation since the first of the year are: The Winona Interurban Railway, between Goshen and Winona; the Toledo & Chicago Interurban Railway, from Waterloo to Auburn and from Garrett to Ft. Wayne; the Marion Bluffton & Eastern Traction, from Ft. Wayne to Bluffton; the Muncie & Portland Traction, from Muncie to Portland; the Terre Haute Traction & Light, from Farmersburg to Sullivan; the Evansville & Mt. Vernon Traction, from Evansville to Mt. Vernon, and the Evansville Suburban & Newburgh Railway, from Evansville to Boonville and from Evansville to Newburgh.

The lines upon which construction has started since January 1 are: The Winona Interurban Railway from Warsaw to Peru; the Ft. Wayne & Wabash Valley Traction from Logansport to La Fayette; the Indianapolis Crawfordsville & Western Traction from Indianapolis to Crawfordsville; the Evansville Princeton & Vincennes Interurban from Princeton to Vincennes; the Indianapolis Columbus & Southern Traction from Columbus to Seymour; the Indianapolis & Louisville Traction from Seymour to Sellersburg, the Indianapolis & Cincinnati Traction from Rushville to Connersville; the Evansville & Eastern Electric Railway connecting at Newburgh for Rockport and Grand View, and the Indianapolis New Castle & Toledo Electric Railway from Indianapolis to New Castle and Muncie.

Lines that are expected to be put in operation during the next six months are as follows: The Northern Indiana Railway from South Bend to La Porte; the St. Joseph Valley Traction from La Grange to Angola; the Toledo & Chicago Interurban Railway from Garrett to Kendallville; the Marion Bluffton & Eastern Traction from Bluffton to Marion; the Indianapolis Crawfordsville & Western Traction from Indianapolis to Crawfordsville; the Indianapolis & Western Railway from Plainfield to Brazil, and the Indianapolis & Cincinnati Traction from Rushville to Connersville and from Shelbyville to Greensburg.

Strang Motor Car On Its Way From Philadelphia to Kansas City.—The gasoline-electric motor car "Marguerite," manufactured by the J. G. Brill Company, of Philadelphia, and the Strang Gas-Electric Car Company, of Hoboken, N. J., for the Missouri & Kansas Interurban Railway, left Philadelphia on July 5 and will run to Kansas City with its own power, making frequent stops en route for inspection by those interested. The car will run over the tracks of the Baltimore & Ohio Railroad to Chicago and over the Chicago & Alton to Kansas City, where it will be put in service on the Missouri & Kansas Interurban Railway, a 22-mile line between Kansas City, Mo., and Olathe, Kan. The "Marguerite" is similar to the experimental car "Ogerita," manufactured by the same company, which in February made the trip to Kansas City and which has been in continuous service since that time, now making four round trips daily between Kansas City and Lenaxa, 15 miles. Except for renewal of brake shoes, not one cent has been spent for repairs, although the car has covered 18,000 miles. The "Marguerite" is a standard type combination passenger and smoking car, seating 42 persons, and measures 52 feet 9 inches over ends. The engine is a four-cylinder vertical type with 10x10-inch cylinders. The car has been subjected to a rigid test on the Baltimore & Ohio tracks between Philadelphia and Wilmington, maintaining an average speed of 55 miles per hour.

Philadelphia Rapid Transit's Elevated Road Nearing Completion.—The last span of steel connecting the two sections of the Market street elevated line of the Philadelphia Rapid Transit Company was put in place on July 14. The connection was made at Forty-fifth street and the structural work of the elevated road is now completed from the west side of the Schuylkill river to the terminal site at Sixty-third and Market streets. The work of completing the structure is progressing rapidly and the engineers of the Rapid Transit Company hope to have the elevated in operation within three months. The car barns and passenger terminal west of Sixty-third street will be ready for occupancy as soon as the road is opened for operation. The machinery is being installed at the Fifty-sixth street power station and the station on Deleware avenue is being made ready as fast as possible. The subway contractors have been instructed to have the temporary loop between Fifteenth street and the west end of the city hall plaza made ready for use within 60 days. It is the purpose of the traction company not to use the city hall loop until next spring. The passenger station under Broad street station is nearing completion. The contract for the construction of the concrete foundations for the elevated structure on Delaware avenue has been awarded and work will be started in the near future. The Delaware avenue line will extend from Arch street to South street with a large station extending from Market to Chestnut street and one at South street.

Reconstruction Progress in San Francisco.—One of the most interesting pieces of reconstruction work in which the United Railroad of San Francisco is engaged at present is the conversion of the Hayes street cable road into an electric line. The work involves the removal of the concrete conduit and the iron yokes that support the track and slot rails. The work is being done largely by machinery and a scheme has been devised to pull up the conduit by means of electric power. The device used consists of an electric crane that pulls the iron yokes of the conduit out of the concrete in which they are embedded, breaking up the concrete structure at the same time. A short length of 9-inch rail is chained to the protruding top of a yoke, the rail being of sufficient length to permit its operation as a lever. The long end of the lever is operated by the crane and the yoke torn from the track. The larger masses of concrete thus dislodged are broken up by hand so that they may be further reduced by a rock crusher, and the concrete thus reduced is put back in the ground as a foundation for the new roadbed.

Work on the reconstruction of the other cable lines is going forward at a rapid rate. The Sutton street line has been completed and is in operation from Fillmore to Diversadero streets. The United has been greatly hampered in its work by the scarcity of labor and all the men available at present are concentrated on the Polk, Larkin and McAllister street lines With the completion of these lines all the cross-town lines will be in running order. Service has been resumed on the Sansome street line which had not been in operation since the earthquake. Work has been commenced on the tracks of the Sacramento and Jackson street lines and it is expected that they will be in operation shortly. When these have been trolleyized the United will have practically all of its lines under electrical operation.

It is reported that an elevated roadway for Market street has been projected. A plan has been submitted by which the present level would be reserved for railway tracks and heavy trucking while an elevated roadway to accommodate foot passengers and the lighter vehicles would be built of concrete and steel. The length of the roadway will be about three-quarters of a mile, extending from Kearney street to the Ferry building and about two years' time will be required for its completion. The plan involves using the present sidewalk space for steam railroad tracks with the electric car tracks remaining where they are. The space intervening would be used by the heavy trucks. It is urged as a point in favor of the project that the steel structure tied to the buildings on each side of the street would materially strengthen them and thus make this section of the city less easily affected by earthquakes.

PERSONAL MENTION

Mr. W. H. Hollenbech, who has held the position of superintendent of buildings with the Milwaukee Electric Railway & Light Company, has resigned.

Mr. H. H. Smith has been appointed superintendent of the Lansing & Battle Creek Traction Company, of Battle Creek, Mich., succeeding Mr. E. S. Loomis, resigned.

Mr. C. C. Pierce, of New York, has been appointed general superintendent of the East St. Louis & Suburban Railway Company of East St. Louis, Ill., and its allied companies.

Mr. J. P. Morton, formerly superintendent of the Ft. Worth city lines of the Northern Texas Traction Company, has been placed in charge of the company's lines at Oak Cliff.

Mr. A. A. Lightfoot has severed his connection with the Hartford & Springfield Street Railway Company to become assistant superintendent of the Fitchburg & Lowell Street Railway Company.

Mr. W. W. Marinan has been appointed superintendent of the Dunkirk & Fredonia Railroad Company of Fredonia, N. Y., and has recently assumed charge. Mr. Marinan succeeds Mr. W. J. Hillery.

W. B. Tarkington.

Mr. W. B. Tarkington, who, since April, 1903, has been general superintendent of the Detroit Monroe & Toledo Short Line Railway Company, has been appointed superintendent of transportation of the Milwaukee Electric Railway & Light Company. His appointment was effective on August 1, and he will have charge of the operation of both the city and interurban lines of the Milwaukee system. Mr. Tarkington has been connected with electric railways in an official capacity since 1890 and his experience covers all departments of electric railway operation. For several years he was general superintendent of the Omaha & Council Bluffs Street Railway Company which was the first electric line built by the old Thompson-Houston Company. Just prior to his departure for Milwaukee Mr. Tarkington was presented with a handsome silver loving cup by the employes of the Detroit Monroe & Toledo Company, in token of the high regard in which he was held.

Mr. J. L. Adams, formerly chief engineer of the Hartford Manchester & Rockville Tramway Company, of Hartford, Conn., has been appointed general manager of the Indianapolis Columbus & Eastern Traction Company's lines.

Mr. N. A. Thompson has been appointed soliciting passenger and freight agent for all lines of the Indiana Columbus & Eastern Traction Company at Columbbus, O. Mr. C. O. Baker has been appointed to a similar position at Dayton.

Mr. J. Whyte Evans has resigned as president of the United Railways of Portland, Ore., in consequence of the sale of that property to the C. E. Loss syndicate of San Francisco, and Mr. W. L. Benham has been elected to succeed him.

Mr. W. H. Simms, formerly station master at Broad street station, Philadelphia, Pa., of the Pennsylvania, has been appointed general superintendent of the Philadelphia & Western Railroad. Mr. Simms assumes his new duties on August 1.

Mr. E. J. Rauch, recently superintendent of motive power for the Columbus Newark & Zanesville at Newark, O., has entered on his duties as superintendent of railways for the Saginaw Valley Traction Company. He succeeds Mr. C. J. Young, who recently resigned.

Mr. M. E. Sampsell, representing Judge Grosscup, has been elected the seventh member of the board of directors of the Chicago Railway Company. The directorate now includes: Henry A. Blair, James H. Eckels, W. N. Eisendrath, John W. Gary, E. D. Hulbert, F. A. Rawson and M. E. Sampsell.

Mr. H. A. Johnson, for the past twelve years chief engineer of the railway department of the Public Service Corporation of New Jersey, South Jersey division, has resigned, effective on August 1, to accept a position as general superintendent of the Tri-City Electric Railways & Lighting Company, of Davenport, Ia. Mr. J. N. Akarman has been appointed to succeed Mr. Johnson, with the title of general superintendent of the railway department, South Jersey division.

Mr. W. T. Dougan has been appointed to serve on the executive committee of the American Street & Interurban Railway Engineering Association in place of Mr. W. Boardman Reed, who has resigned. Mr. Reed will continue his membership in the engineering association and will continue to serve on the committee of maintenance of way. Mr. Dougan succeeds Mr. Reed as engineer of maintenance of way and buildings on the New York City Railway.

Mr. H. D. Hagerty has been appointed general manager of the Little Rock (Ark.) Railway & Electric Company, succeeding Mr. C. O. Simpson, who recently resigned to become vice-president of the Citizens' Savings Bank & Trust Company, of Birmingham, Ala.

Mr. Henry B. Ivers has resigned as treasurer and general manager of the Westerly (R. I.) Railway & Lighting Company, to become associated with Philip H. Farley, of Boston, in the firm of Farley, Ivers & Co., to deal in electric railway and lighting securities.

Mr. R. M. Searle, heretofore general manager of the Westchester Lighting Company, of Mount Vernon, N. Y., has been appointed general manager of the Rochester Railway & Light Company, in place of Mr. W. M. Eaton, who retains his position as second vice-president.

Mr. H. H. Littell, who, for the past 18 months has been first vice-president of the San Antonio Traction Company and the San Antonio Gas & Electric Company, has resigned, his resignation to be effective August 1. Mr. Littell and his family will leave for an extended tour in Europe.

Mr. Arthur G. Jack has been appointed superintendent of the Chester Traction Company, of Chester, Pa., succeeding Mr. C. V. Mills, resigned. Mr. Jack has been for the past few years superintendent of the Delaware County & Philadelphia Electric Railway, of Clifton Heights, Pa.

Mr. J. S. Bristol, formerly connected with the power house construction department on the Danville-Champaign division of the Illinois Traction System, has recently been appointed superintendent of substations on the Springfield-St. Louis division, with headquarters at Gillespie, Ill.

Mr. C. M. Paxton, secretary and traffic manager of the Dayton & Troy Electric Railway, has been promoted to be general manager, with office at Tippecanoe City, O. Mr. L. D. Johnson, traveling freight agent, has been made traveling freight and passenger agent, with headquarters at Tippecanoe City.

Mr. G. G. Crane, for the past two years master mechanic of the Joliet Plainfield & Aurora Railroad, with office at Joliet, Ill., has resigned to accept a position as assistant engineer for the Allis-Chalmers Company, of Milwaukee, Wis. Mr. J. C. Jarvis, heretofore barn foreman, has been appointed master mechanic, to succeed Mr. Crane.

Mr. B. M. Brown, heretofore superintendent of the Columbus London & Springfield Railway and the Columbus Grove City & Southwestern Railway, has been appointed general superintendent of the Dayton and Richmond and the Dayton and Union City divisions of the Indiana Columbus & Eastern Traction Company, with office at Dayton, O.

Mr. Pierce C. Keilholtz has resigned as consulting engineer of the United Railways & Electric Company of Baltimore, Md. He has held the position since the formation of the corporation and was previously employed in a similar capacity by the former city & Suburban Railway. Mr. Keilholtz will devote himself to his private consulting engineering practice.

Mr. F. S. Eberhart, superintendent of the Interurban Railway, of Des Moines, Ia., has been appointed superintendent of bridges and maintenance of way, succeeding Mr. Morton Macartney, resigned. Mr. F. S. Cummins, chief engineer, has been appointed superintendent also, in place of Mr. Eberhart. Mr. E. B. Bioghler, heretofore chief clerk to President Polk, has been appointed superintendent of traffic.

Mr. A. L. Neereamer, who has been traffic manager of the Columbus Delaware & Marion since its organization, has been promoted to be general superintendent, with office at Delaware, O. The positions of traffic manager and assistant traffic manager have been abolished. Mr. E. J. Davis, who has held the last mentioned position, has been made general passenger and freight agent, with office at Columbus, O.

Mr. M. L. Harry has been appointed general superintendent of all properties of the Illinois Traction System from Clinton south to St. Louis. This includes street railways, gas and electric plants. All superintendents will report directly to Mr. Harry at Decatur. By the new arrangement of officers of the system Mr. M. G. Linn takes charge of the operation of the line between Clinton and Bloomington. Mr. Thomas Wood is made superintendent of the interurban lines between Springfield and St. Louis. W. H. Owens is superintendent of the Madison County Light & Power Company, which looks after the lighting interests between Edwardsville and Venice. Mr. Edward Bell is assistant to Mr. Owens, with headquarters at Granite City. Mr. A. V. Schroeder is superintendent of the Decatur Railway & Light Company and also the interurban lines between Decatur and Springfield and Decatur and Clinton. Mr. L. O. Williams is superintendent of transportation on the line from Decatur to Clinton and will report to Mr. Schroeder.

Obituary.

Henry Thompson, formerly of New York, N. Y., and at one time president of the Metropolitan Street Railway, died at his home in Stamford, Conn., on July 18.

H. P. Bruce, formerly general manager of the Demerara Electric Company, of British Guiana, and associate engineer of the Pittsburg Railways Company, and lately connected with the firm of Rockwell & Bruce, of New York, died on July 26.

CONSTRUCTION

TRACK AND ROADWAY.

Portland Railway.—The new extension from Portland, Ore., to Vancouver, Wash., was recently opened for traffic.

Lima & Toledo Traction Company.—The work of track laying on this line is progressing rapidly and it is announced that cars will be operated as far as Leipsic, O., by August 15.

Brooklyn Rapid Transit Company.—Officers of this company have announced that all plans for the construction of new trolley lines in Brooklyn have been abandoned for the present.

Cincinnati (O.) Traction Company.—This company is planning to establish a street car service through the village of Bond Hill. The plan is to extend the Avondale line to Bond Hill by way of Paddock road.

Honesdale & Hawley (Pa.) Street Railway.—It is reported that the contract for building this road has been let to the Wayne Construction Company. Material has been ordered and active work will soon commence.

Central Pennsylvania Traction Company (Harrisburg, Pa.).—This company is making extensive improvements in its line from Harrisburg to Steelton. Track is being relaid and considerable grading is being done.

Scioto Valley Traction Company.—It is announced that the Lancaster branch of this road will be extended to Logan and Nelsonville, O., and that the Chillicothe line will be extended to Pomeroy and Jackson, O.

Indianapolis Huntington Columbia City & Northwestern Railway.—It is announced that this company has secured $1,500,000 and will proceed at once to build the road from Goshen to Lake Wawasee, Ind., 13 miles.

Columbia & Walla Walla Traction Company.—The survey for this proposed line from Dayton to Wallula, Wash., via Walla Walla, Milton and Freewater has been completed. J. W. Morrow, of Waitsburg, is general manager.

Benton Harbor-St. Joseph Railway & Light Company.—We are informed that this company will build a line from Benton Harbor to Kalamazoo. Two surveys have been made although the location has not been decided upon.

Cincinnati Georgetown & Portsmouth Railroad.—Right of way is being secured and surveys are being made for an extension of the line from West Union to Portsmouth, O., 35 miles. A. W. Comstock, president, Cincinnati, O.

Galveston Houston & Henderson Railway.—It is reported that this company expects to equip its line between Galveston and Houston, Tex., for electrical operation. It is understood that the work will be begun immediately.

Springfield & Southern Electric Railway.—This company is projecting a line from Springfield to Pana, Decatur and Vandalia, Ill. The Springfield Business Men's Association, headed by Judge J. G. Finn, of Decatur, Ill., is interested.

Chisholm, Minn.—It is reported that work has begun on the new electric line between Chisholm and Hibbing, Minn. R. F. Berdie, manager of the construction work, announces that next year the line will be extended to Eveleth.

Wheeling (W. Va.) Traction Company.—This company is reported to be completing an extension from Martin's Ferry to Portland, O., and cars will be in operation by September. Thomas J. Stringer, of Portland, O., is the contractor.

Tidewater Development Company (Birmingham, Ala.)—It is announced that the contracts for building this company's 125-mile line from Gadsden to Tuscaloosa, Ala., will be let in November. J. M. Dewberry, Birmingham, Ala., is president.

Brownsville Street Railway (Brownsville, Pa.).—This company has filed a certificate of extension at Uniontown, Pa., for a line in the borough limits of Brownsville to connect with the proposed line to Uniontown. H. R. Lynn is president.

Syracuse (N. Y.) & Suburban Railroad.—It has been practically decided to build an 18-mile extension from Manlius through Cazenovia and Delphia to De Ruyter, N. Y. Charles E. Hubbell, of Syracuse, is vice-president and general manager.

Spokane (Wash.) & Inland Railway.—It is expected that the work of constructing the extension of this road from Palouse, Wash., to Moscow, Idaho, will start at once. Surveys have been made and practically all the right of way purchased.

Muncie & Portland Traction Company.—It is announced that it has been definitely decided to build an extension of this line from Portland to Celina, O., and that construction work will begin by August 15. Geo. F. McCulloch, of Muncie, is president.

Great Falls & Old Dominion Railway (Washington, D. C.).—The work of double-tracking this line has been begun. Four miles of the work will be completed by September 1, and the remainder next spring. The work is delayed by the scarcity of rails.

Rochester Syracuse & Eastern Railroad.—The Syracuse Railroad Construction Company will let contracts on August 15 for grading and masonry on section No. 8 of this road, from Savannah to Port Byron, N. Y. The work consists of about seven miles of double track and about 250,000 cubic yards of excavation, 4,500 cubic yards of concrete and about 30,000 feet of piling.

About 2,700 cubic yards of this concrete work will be in 27 piers and two abutments crossing the Seneca river and requiring sheet piling, cofferdam and caisson work. T. H. Mather, chief engineer, Syracuse.

Toledo Port Clinton & Lakeside Electric Railway.—The last section of this road from Marblehead to Toledo, O., has been completed and cars will soon connect with those of the Toledo Railway & Light Company over the latter's Starr avenue line.

Salem, Ore.—Interests allied with the Willamette Valley Traction Company are promoting a 28-mile road from Salem to Stayton, Ore. It is said that a large part of the right of way has been secured and that surveyors have been in the field for a month.

Hickory, N. C.—It is stated that construction work will begin not later than August 15 on the electric road which Col. M. E. Thornton is promoting, to connect Catawba Springs, Newton, Conover, Rhodhiss, Brookford, Hickory and neighboring cotton mills.

St. Joseph & Grand Island Railway.—Men are now in the field making the final surveys for the extension of this road from Stouts to Highland, Mich., about 7 miles. The right of way has practically all been secured and financial arrangements have been made.

Shelbyville & Ohio River Electric Railroad.—The city council of Eminence, Ky., has granted this company a right of way through the city and work has begun. Cars are to be in operation between Eminence and New Castle, a distance of 4 miles, within a year.

Grays Harbor & Puget Sound Electric Railway.—The line of this road, which is to connect Grays Harbor, Olympia and Seattle, Wash., has been located from Grays Harbor to Rochester, and surveyors are now in the field locating the line between Little Rock and Olympia.

Kent Traction Company (Chestertown, Md.).—It is reported that D. E. Baxter & Co., of New York, has the contract for building this company's line from Chestertown via Fairlee to Tolchester Beach, 10 miles, with a branch eight miles long from Fairlee to Rock Hall.

Atlanta Macon & Griffin Interurban Railway.—A corps of engineers and surveyors has been started out to locate this line, connecting the cities named. Philip S. Fitzgerald, formerly of the engineering department of the Southern Railway, has been engaged to supervise the work.

Youngstown (O.) & Southern Railroad.—It is reported that this steam line will be electrically equipped from Leetonia to Youngstown, O. The contract has been awarded to J. G. White & Co., of New York and covers the necessary rolling stock, substations and other equipment.

Columbus Marion & Bucyrus Electric Railway.—A large force of men and teams has begun the work of grading the line between Marion and Bucyrus, O., a distance of twenty miles. The line is being built on a 50-foot right of way and is exceptionally free from curves and grades.

Hudson River & Eastern Traction Company.—It is reported that contracts for building this road from Ossining to Mt. Pleasant and Sherman Park, N. Y., will shortly be let. Capital has been secured. L. B. Grant is president and C. H. Werner, treasurer. Offices at 32 Liberty street, New York.

Fort Dodge Des Moines & Southern Electric Railway.—Work on this line from Des Moines to Fort Dodge, Ia., 100 miles, is progressing rapidly. Grading has been completed from Kelley south towards Des Moines, 11 miles, and 4½ miles of track has been laid. Homer Loring, of Des Moines, is president.

Tacoma Railway & Power Company.—All the material for the construction of the line from Tacoma to American Lake, Wash., has been received, including the overhead material, and the only obstacle to construction now consists of a few right of way suits. W. S. Dimmock, of Tacoma, is general manager.

Marion Bluffton & Eastern Traction Company.—Work on this line is progressing rapidly. The bridge over the Salamonie river is nearly finished, as is also the power house at Van Buren, Ind. Preparations are being made for ballasting the track with gravel. It is expected that cars will be running by September 1.

Lafayette & Logansport Traction Company.—An officer of the Fort Wayne & Wabash Valley Traction Company, which is building this extension from Lafayette to Logansport, Ind., is quoted as saying that the line will be opened by January next. Five contractors are now at work on various sections of the line.

Alton Jacksonville & Peoria Railway.—This company recently started work laying rails in Piasa street in Alton, Ill., for its electric line from Alton to Jacksonville. From Piasa street the line will run out Belle street to the city limits and thence to Jerseyville, Carrollton, White Hall, Roodhouse and Jacksonville.

Willamette Valley Traction Company (Portland, Ore.).—A large force of men is to be put to work at once at the Salem end of this line from Portland to Salem, Ore., with the intention of completing the road from Salem to Shemawa in time for the State Fair in September. W. S. Barstow of Portland is the engineer in charge.

Pittsburg Harmony Butler & New Castle Street Railway.—Contracts for the grading and construction of the first half of this line from Pittsburg to New Castle and Butler Pa., have been awarded. W. W. Kelly, of McKeesport, Pa., has the contract for the first section. Rights have been obtained to operate over the tracks of the Pittsburg Railways Company in Pittsburg and Allegheny. Contracts have been placed for 16 cars and 10,000 tons of 80-pound rails. Work on the power house at Eidenan will begin this week.

Cincinnati Bluffton & Chicago Railway.—The promoters of this road, which is already constructed between Bluffton and Portland, Ind., announce that additional financial backing to the amount of $700,000 has been secured and that the road will be extended to Huntington on the north and Union City on the south.

Indiana Rapid Transit Company.—It is announced that financial arrangements have been made and that the work of construction will begin at once from Logansport to Terre Haute, Ind., through Deer Creek, Carroll, Sharon, Darwin, Burlington, Frankfort, Thorntown, Crawfordsville and Rockville. P. M. Dunn, of Indianapolis, is president.

Monroe & Northumberland Trolley Company.—The project for building this road from Stroudsburg to Delaware Water Gap, Pa., which was abandoned two years ago after some work had been done, is to be revived. Financial arrangements are being made for building the road and it is expected that construction can be started by September 1.

Sharon & Wheatland Street Railway.—This company last week began building an extension from its terminus in South Sharon, Pa., into Wheatland, and the first cars will be running into that town in a few weeks. It is stated that the company will eventually build the line on to West Middlesex. H. L. Patterson, Youngstown, O., is chief engineer.

East Liverpool Traction & Light Company.—This company has closed deals for a complete right of way between Wellsville and Empire, O., and will begin work at once on the construction of an extension westward. This will give the company a through line from Smith's Ferry, Pa., to Brilliant, O., passing through East Liverpool, Wellsville, Empire and Toronto.

Rome & Oneida Electric Railway.—D. C. Haddock, vice-president of this company, is quoted as having stated that the proposed line from Syracuse to Oneida, N. Y., will be constructed in a short time. It will be 37 miles long and be a part of the Rome & Oneida system. The construction of the line between Rome and Oneida will be started in the near future.

Lafayette & Hoopeston Interurban Company.—This company was recently organized at Otterbein, Ind., to build a road from Lafayette to Hoopeston, Ind., paralleling the Lake Erie & Western Railroad. The following were elected directors: Henry A. Miller, Isaac E. Switzer, David E. Harrington, Elmer Hawkins, Edward Zies, William Randall, John H. Banks, Ward E. Smith and Lawrence Burns.

Sandusky Norwalk & Mansfield Electric Railway.—The building of this line is progressing rapidly and 25 miles are now in operation including the line from Norwalk to Plymouth and a stub to Chicago Junction. The company is now pushing the work of constructing the link between Plymouth and Shelby. When this link is completed the new line will connect the Lake Shore Electric with the Ohio Central.

San Francisco Vallejo & Napa Valley Railway.—Contracts are to be let in a few weeks for an electric line from Vallejo to Calistoga, Cal., to connect at Vallejo with a line of steamers from San Francisco. The road has been financed and surveyed and right of way has been secured. W. F. Botsford, of Los Angeles, president; L. J. Perry, Napa, Cal., vice-president; C. H. Wallace, St. Helena, Cal., chief engineer.

Dallas Interurban Electric Railway.—J. Mercer Carter, of Dallas, Tex., and associates are about to organize a company with the above title to build an electric railway from Dallas to Lake Cliff, Greenville and Denison, Tex. The same men are also organizing the Union Construction Company with a capital stock of $500,000 for the purpose of building railroads and railroad bridges for other companies.

Lake Shore Electric Railway.—The contract for grading on the extension from Sandusky to Fremont, O., under the name of the Sandusky Fremont & Southern has been let to J. N. Bick, of Toledo, and work will be started at once. The line will be about 22 miles in length and will pass through Whitmore, Erlin and Castalia. The contracts for the Fremont-Tiffin and Tiffin-Fostoria lines will soon be let.

Bucks County & Willow Grove Transit Company.—Wynne James, secretary and treasurer, writes that surveys have been made and that construction is about to begin on this line from Doylestown to Perkasie, Pa., 19 miles. The route includes Fountainville, Dublin, Bormey Glen and Silverdale. W. C. Riffert, president, Reading, Pa.; G. R. Van Reed, chief engineer, Reading, Pa. Headquarters Doylestown, Pa.

Mattoon Shelbyville Pana & Hillsboro Railroad.—We are officially informed that grading will probably begin on this line, which extends from Hillsboro to Mattoon, Ill., a distance of 60 miles, some time this fall. Contracts will be let later. The officers are W. R. Patton, Charleston, Ill., president; W. H. Schott, Chicago, Ill., chief engineer, and J. B. Craig, secretary. The headquarters of the company are at Charleston, Ill.

Lake View Traction Company.—W. E. Willett, secretary and general manager, writes that construction will begin September 1 on this line from Memphis, Tenn., to Clarksdale, Miss., 77 miles, via Rain, White Haven, Tenn.; and Lake View, Penton, Robinsonville, Hollywood, Tunica, Clayton, Dundee, Coahoma, Clover Hill and Lyon, Miss. The entire route has been surveyed. Maximum grade, 1 per cent. 70-pound rails will be laid. W. A.

Percy, president; John G. Foster, chief engineer, 552 Randolph building, Memphis, Tenn.

Ogden (Utah) Rapid Transit Company.—This company has begun re-laying its line on Twenty-fifth street in Ogden with 65-pound rails, and will double-track that line from Lincoln avenue to Washington street.

Milwaukee Northern Railway.—Grading on this road from Milwaukee to Sheboygan and Fond du Lac, Wis., has been nearly completed from Port Washington south to the Milwaukee county line. As soon as this section has been completed work will be commenced between Port Washington and Sheboygan and between Cedarburg and Fond du Lac. The Comstock-Haigh-Walker Company, of Detroit, Mich., has the contract.

Indianapolis Columbus & Southern Traction Company.—Work on the extension from Columbus to Seymour, Ind., is progressing rapidly at several points along the line and it is now expected to have the road in operation by September 1. By that time the line of the Indianapolis & Louisville Traction Company from Jeffersonville to Seymour is expected to be in operation, giving a through connection between Louisville and Indianapolis.

Clinton Cheyenne & Canadian Interurban Railway.—C. S. Gilkerson, president, Cheyenne, Okla., writes that this electric line will extend from Clinton, Okla., to Canadian, Tex., 150 miles, with a branch from Cheyenne, Okla., to Mangum, Okla., 60 miles. The route includes the towns of Cordell, Hammond, Cheyenne and Hamburg, Okla., Canadian, Tex., and Berlin, Sayre, William and Mangum, Okla. No contracts have been let as yet.

Boston & Eastern Electric Railroad.—A company is being formed to build a double-track, high-speed electric road from Beverly to Boston, Mass., passing through Salem, Peabody, Lynn, Saugus, Revere and Chelsea, to connect with the Boston Elevated Railway. Several prominent capitalists are interested in the project and John H. Bickford, of Boston, has been selected to take charge of the engineering work. Surveys have been made.

Gainesville Whitesboro & Sherman Electric Interurban Railway.—It is reported that work on this interurban road from Gainesville to Sherman, Tex., is progressing rapidly and that extra men and teams are being put to work on the grading as fast as they can be secured. Two miles of grading have been completed and the work of track laying will be started at once. John King, of Gainsville, is vice-president and general manager.

Indianapolis & Western Traction Company.—The contract for grading this line from Greencastle to Brazil, Ind., has been let to MacArthur Brothers, of Chicago. The National Concrete Company, of Indianapolis, has the contract for the concrete-steel arches. J. T. Adams, of Columbus, O., has the contract for ballasting and tracklaying. Ties have been delivered and the work will be pushed as rapidly as possible in order to have the line in operation by January 1.

Oregon Northern Railway.—An official report states that this company will build a road from John Day River to Baker City, Ore., 170 miles, passing through Blalock, Arlington, Olex, Hardinau and Parker. Surveys have been completed from John Day River to Parker, 85 miles, and surveying is in progress from Parker to Baker City. Grading is to begin in the fall. W. J. Mariner, of Blalock, is president, and G. W. Winkle, of Walla Walla, Wash., is chief engineer.

Rock River Traction Company (Sterling, Ill.).—F. E. Andrews, vice-president and general counsel, writes that surveys have been completed, right of way secured, and some progress made toward securing funds for the construction of this line which is to connect Sterling, Prophetstown, Geneseo and Rock Island, Ill. Franchises in several of the towns along the line have been secured and arrangements made for entering the cities of Rock Island, Davenport and Moline. Levi Waterman is president.

St. Louis (Mo.) Hillsboro & Southern Electric Railway.—Mr. H. M. Bowen, vice-president and general manager of this company, is quoted as having said that contracts have been let and the work of construction will start at once. The road will be 40 miles in length and engineers estimate its cost at about $650,000. The following are the officers and directors: R. E. Williams, president; H. M. Bowen, of Alton, Ill., vice-president and general manager; H. D. Brandt, secretary; J. H. Winer, of Hillsboro, Mo., treasurer; and S. D. Winter.

Fort Wayne & Springfield Railway.—W. H. Fledderjohann, president and general manager, writes that grading has been completed on this line from Fort Wayne to Decatur, Ind., via Monmouth, Middletown and Haslecastle, 21 miles, and that 8 miles of track have been laid. The maximum grade is less than 2 per cent and 70-pound rails will be used. T. W. Shelton, chief engineer, J. H. Koenig, vice-president and general counsel; B. A. Fledderjohann, secretary; M. H. Wilson, treasurer. Headquarters, Decatur, Ind.

Washington Baltimore & Annapolis Electric Railway.—Work was recently begun on the Baltimore end of this company's line from Washington to Baltimore and Annapolis. A large steam shovel was put into service excavating at Westport and 300 men are now at work. The Fidelity Construction Company of Cleveland, has the contract for the general work and the bridges are to be built by the Interstate Engineering Company, of Bedford, O. Several miles of grading and tracklaying has been completed. The company owns the old Annapolis Washington & Baltimore steam road and will convert it for electrical operation. The 56-pound rails on the branch from Odenton to Annapolis, 14 miles long, are now being replaced by 80-pound rails. M. A. Munn, of Baltimore, is chief engineer.

POWER HOUSES AND SUBSTATIONS.

Indianapolis New Castle & Toledo Electric Railway.—This company has purchased property in New Castle, Ind., at a cost of $300,000 upon which the new power house and car shops will be built.

Illinois Traction System.—It is reported that improvements involving an expense of $100,000 will be made to the power house at Edwardsville, Ill., and that it will be used as an auxiliary substation.

People's Gas & Electric Company (Burlington, Ia.).—At the power house at Fourth and Market streets two large new boilers with patent automatic stokers are to be installed, at an expense of $20,000.

Binghamton (N. Y.) Railway.—It is reported that plans have been completed for a 70x30-foot addition to the company's power house and for the installation of a storage battery. The Electric Storage Battery Company has the contract for the battery installation.

Indiana Columbus & Eastern Traction Company.—This company is making plans to increase greatly the capacity of the Hebron, O., power station of the Columbus Buckeye Lake & Newark division. Four 300-horsepower boilers and a large generator will be installed.

Northern Indiana Railway (South Bend, Ind.).—This company's power house at Osceola, which was wrecked some time ago by a severe storm, is to be rebuilt in a more substantial manner. No work will be done on the extension in Goshen until the work on the power house is completed.

Wichita (Kan.) Railroad & Light Company.—This company has recently added to the equipment of its power plant at Tenth and Wichita streets by the installation of an 850-horsepower Hamilton-Corliss cross-compound engine direct-connected to a Western Electric 500-kilowatt generator.

Louisville & Indianapolis Traction Company.—J. H. Greeley, real estate agent, has closed a deal for land at Scottsburg, Ind., on which is to be built the power house to supply current for the line between Sellersburg and Seymour. It is stated that the power house, car barns and repair shops will cost $200,000.

Kokomo Marion & Western Traction Company.—This road, which furnishes a part of the trolley connection between Marion and Logansport, Ind., via Kokomo is preparing to furnish residents along its lines with electric power and lights. The company has placed orders for additional electric and power equipment to take care of the new business.

Inland Empire Railway (Spokane, Wash.).—This company has about 75 men engaged in the preliminary work for its power station at Nine Mile Dam, nine miles below Spokane, Wash. Trenches are being dug and derricks, etc., are being erected. The plant is being laid out with the expectation of its eventually having a capacity of 20,000 horse-power.

Beaumont (Tex.) Traction Company.—Frank J. Duffy superintendent, has recently contracted with the Hooven, Owens, Rentschler Company, of Hamilton, O., for a 450-horsepower Hamilton-Corliss engine and with the Westinghouse Electric & Manufacturing Company for a 300-kilowatt generator, which will more than double the capacity fo the company's power station.

Cincinnati Milford & Loveland Traction Company.—This road is installing two Allis-Chalmers horizontal cross-compound heavy duty engines, 16 and 24 by 42 inches, for direct connection to two Allis-Chalmers Bullock type 500 kilowatt generators, and other machinery, in its new power plant necessitated by the extension of its system from Milford to Blanchestor, a distance of 21 miles.

Des Moines (Ia.) City Railway.—It is reported that this company is contemplating the building of a new power house in Des Moines. The management has announced that a line to Carlisle will be built if the necessary finances can be secured and several other extensions are under consideration. The power house will cost $200,000 and will be run in addition to the present plant on East Fourth street.

Jackson (Tenn.) Railway & Light Company.—This company is arranging to erect a power house 97x103 feet in floor area with a capacity of 600 kilowatts, to supply electric current to operate the street railway system and to be sold for light and power; also a car barn 140x170 feet. About $100,000 will be expended in buildings and equipment. Chas. D. Lehmkuhl, Jackson, Tenn., constructing engineer.

Municipal Traction Company (Cleveland, O.).—The site for this company's new power house has been selected. The building is to be erected on a plot 120x360 feet on the Cuyahoga river just below the Willard street bridge, and engineers are now making a survey of the property preparatory to completing plans. General Manager A. B. Dupont has full charge of the plans. Construction work will begin at once.

Pittsburg Railways Company.—This company has let contracts to the Westinghouse Electric & Manufacturing Company for an addition of nearly 30,000 horse-power in boilers, engines and electrical machinery to the Brunot's Island power house. The contract, which involves over $300,000, includes three turbine engines of 7,500 horsepower each, and one of 5,000 horsepower, besides additional boiler capacity, electric generators, switchboards and wiring.

SHOPS AND SHOP EQUIPMENT.

Cedar Rapids (Ia.) & Marion Street Railway.—A contract has been let to Loomis Brothers, of Cedar Rapids, for replacing the present car barn at Marion with a 28x50-foot brick structure.

Cincinnati Traction Company.—It is reported that this company will erect a new car house on State street, Cincinnati, O. The building will be 113x301 feet in size and will cost about $15,000. Thomas Elliott is chief engineer.

Los Angeles (Cal.) Railway.—This company has purchased a tract of land in East Los Angeles on which it intends to build a brick car house. The structure will be 200 x 250 feet in floor area. E. S. Cobb is the engineer in charge.

York (Pa.) Street Railway.—It is reported that this company will build a new car house and repair shop in York. The new building will be 265x50 feet in size and will have between six and 10 tracks. It will be of brick and be one story high.

Northern Illinois Light & Traction Company (Ottawa, Ill.)—This company has let the contract to Sanders Brothers Manufacturing Company of Ottawa for the building of its new car barn at Ottawa. The building will be 130x40 feet in floor area and is to cost $15,000.

Southeastern Ohio Railway Light & Power Company.—This company will soon let contracts for a large car barn at Powells Mills, Zanesville, O. on a 5-acre tract of land recently purchased for that purpose opposite to Moxahala Park. H. V. Bonnett, of Zanesville, is chief engineer.

United Railways (Baltimore, Md.).—It is reported that this company has purchased the block bounded by Lombard, Eighth, Pratt and Seventh streets, in Highlandtown, Baltimore, and will erect a new car barn on the property to serve the Roland Park, Sparrows Point and Bay River lines.

Consolidated Railway Company (New Haven, Conn.)—Plans have been completed for the erection of a large brick car house, 150x200 feet in floor area, at Norwich, Conn. Provision will be made for a repair shop, waiting room and manager's office. The cost of construction and equipment will approximate $100,000.

Lima, O.—The contract for the car barn and shops which the Schoepf syndicate will build in this city has been let to Mr. V. Heil of Lima. The building will be 221x305 feet in floor area, will be of concrete-steel construction, and will cost approximately $75,000. The shops are to be fitted with the most modern machine tools obtainable.

Anaconda, Mont.—It is announced that work has been begun on the new car barns that are to be build at the western terminus of the Anaconda Copper Mining Company's street railway system in Anaconda. The barns will be 100x200 feet and will be fitted with new and modern appliances. The work is in charge of M. Doyle, superintendent of the railway system.

Chattanooga Railways.—The West Construction Company has been awarded the contract for the erection of the proposed car shops at Third and Market streets, Chattanooga, Tenn., after plans by D. V. Shroop, at a cost of $38,073. The shops are to be of brick, concrete and steel, with a floor area 102x200 feet. The company is also having plans prepared by R. H. Hunt for a proposed $10,000 car barn to accommodate 60 cars.

FRANCHISES.

Palo Alto, Cal.—A franchise has been granted to W. H. H. Hart for five miles of street railway in this town.

Anoka, Minn.—B. J. Witte, of Anoka, has applied for a 50-year franchise for a line to connect Anoka with Minneapolis.

Trenton, O.—A franchise has been granted to the Cincinnati Northern Traction Company for double tracks in the main streets.

Elyria, O.—The Lake Shore Electric Railway has applied for a franchise that will give it access to the public square in this city.

Buffalo, N. Y.—A 25-year franchise for a direct route into the city has been granted to the Buffalo & Lackawanna Traction Company.

New Bedford, Mass.—A franchise has been granted to the Old Colony Street Railway Company to do a freight and express business in this town.

Memphis, Tenn.—The Lake View Traction Company, of which Thomas Taggart, of Indianapolis, is president, has applied for a 35-year franchise for the line which is to connect Memphis, Tenn., and Clarksdale, Miss. A casino is to be built at Lake View, Miss.

Martinsville, Ind.—A 50-year franchise has been granted to the Capital Circuit Traction Company, which proposes to construct an electric road connecting the county seats of the seven counties adjoining Marion county. J. N. Crabb, of Indianapolis, is president.

Springfield, Ill.—The Springfield-Southeastern Interurban is asking the city council for a franchise. It is understood that the promoters have $800,000 to be used in the construction of the road, but an additional $200,000 is sought before the work will be entered upon.

Janesville, Wis.—H. H. Clough, the former general manager of the Rockford Beloit & Janesville Railroad Company, is asking the Janesville city council for a franchise for an extension to Madison, Wis., connecting with the present line from Rockford. Mr. Clough is said to have an option on the Janesville city line and if his petition for a franchise is granted he will take up the city line and also work on the extension.

Geneva, N. Y.—The common council of this city has granted a franchise to the Geneva Phelps & Newark Railroad for constructing and operating an electric line in the city of Geneva.

West Seneca, N. Y.—A 99-year franchise has been granted to the Buffalo Southern and the Hamburg electric railways to run electric cars from Union street to the town line of Elma, and from South Park avenue to Seneca street on the Ridge road extension.

Ottawa, Ill.—The Peoria Streator & Ottawa Railway Company has been granted a 50-year franchise to operate in the streets and thoroughfares of this city. Entrance to the city of Ottawa will be over a new steel bridge to be constructed across the Illinois river.

Cleveland, O.—The Cleveland Electric Railway has applied for a twenty-five-year extension of all its franchises, agreeing to sell seven tickets for 25 cents, with universal transfers. The Municipal Traction Company has also applied for several franchises, on the basis of a three-cent fare.

Portland, Ind.—The city council has granted an additional franchise to the Muncie & Portland Traction Company for the extension of the line to Celina, O. The company is completing the survey and it is probable that actual work on the construction of the line will commence within a very short time.

Elgin, Ill.—The Chicago & Elgin Electric Railway has applied for a 20-year franchise for its new interurban road through the city, on Prairie avenue between Villa and Channing streets, thence down Villa street to Chicago street, thence up Center street to Dexter avenue, thence down Dexter avenue to the river.

St. Joseph, Mo.—A franchise has been granted to the Interstate Electric Railway Company, which is planning to build a line from Kansas City to St. Joseph. Practically all the right of way has been secured. The company must begin work on the road within a year. D. E. Martin, of St. Joseph, Mo., is interested.

Salt Lake City, Utah.—The West Side Rapid Transit Company has applied for an extension of its existing franchises for a period of 50 years. If the extension is granted the company agrees to begin work immediately on an extension of its lines to the mining camps of Garfield and Bingham, a distance of nine miles.

West Seattle, Wash.—The Seattle Electric Company has been granted a franchise for an electric railway on California street and Railroad avenue. According to the conditions of the ordinance work must be commenced within 60 days of the date of acceptance of the franchise and be completed within a year. Jacob Furth is president.

East Liverpool, O.—The city council has granted a franchise to Persifor F. Smith and others, of Pittsburg, Pa., representing the Ohio River & Northern Railway, who propose to build a railroad from Wellsville and East Liverpool to the West Virginia Point coal fields and to a connection with the Erie Railroad at Lisbon, O.

Trenton, N. J.—Governor Stokes of New Jersey has signed a bill authorizing the attorney-general to enter into an agreement with the Atlantic Coast Electric Railway for the construction of a trolley road upon parts of the state camp grounds at Sea Girt, subject to the governor's approval. The term of the agreement is not to exceed 20 years.

Clayton, Mo.—The Kimmswick Hillsboro & Northern Railway Company is asking for a franchise to construct and operate an electric railway through the southern portion of St. Louis county. Permission is asked to build a steel-concrete bridge across the Meramec River to cost not less than $40,000. Charles A. Gutke, of St. Louis, is president of the company.

New Albany, Ind.—The Louisville New Albany French Lick & West Baden Springs Traction Company is asking for a franchise for an interurban line and street railway system in New Albany. The company contemplates in addition to the construction of a line to French Lick and West Baden Springs by way of Paoli to operate a line between New Albany and Louisville.

Salem Ill.—The board of supervisors of Marion county have granted a franchise to the Ohio & Mississippi Electric Railroad to build a railroad on the highways of the county. The company proposes to build a line from Centralia north to Sandoval, Patoka and Vernon; west from Sandoval to Odin, Salem and Iuka; north from Salem to Carter and Kell. William Wham, of Carter, is president, and B. Pullen, of Centralia, is secretary.

Fort Wayne, Ind.—W. H. Fledderjohann, of Decatur, Ind., president and general manager of the Fort Wayne & Springfield Traction Company, has applied for a franchise to run cars into the city over the tracks of the Fort Wayne & Wabash Valley Traction Company. This line, which is to connect Fort Wayne and Portland, via Decatur, has been graded to the city limits, and rails have been laid to within 10 miles of the city.

Bloomington, Ill.—The Bloomington & Normal Railway Electric & Heating Company, a part of the Illinois Traction System, has applied for a 20-year franchise to double-track its present line on Main street from Chestnut to Jefferson street. A syndicate of local capitalists has also applied for franchises for a street railway system in the city, offering to carry passengers for a 3-cent fare and to pay the city 7 per cent of the gross earnings. It is their desire to take over the franchises of the Bloomington & Normal company, which are about to expire.

FINANCIAL

Lima & Toledo Traction Company (Lima, O.).—This company has increased its capital stock from $50,000 to $3,000,000. W. Kelsey Schoepf, of Cincinnati, is president.

Danville & Sunbury Street Railway (Danville, Pa.).—This property was sold at auction recently at Danville, subject to a $60,000 mortgage. It was bid in by a representative of the stockholders.

New York Auburn & Lansing Railroad.—This company, which intends to build a road connecting Auburn and Ithaca, N. Y., has authorized an issue of $1,000,000 thirty-year 5 per cent bonds, redeemable at 105 and interest.

Lake Shore Electric Railway.—The financial statement of this company for the year ending May 31, 1906, shows the gross earnings to have been $829,817.98; the operating expenses $452,414.56, and the surplus for the year $132,553.

Indianapolis & Cincinnati Traction Company.—Charles L. Henry, president, has been appointed receiver for this company. It is announced that the action for the receivership is a friendly suit brought for the purpose of readjusting the company's finances.

Mahoning & Shenango Valley Traction Company.—The Youngstown Park & Falls Street Railway Company of Youngstown, O., has been added to the Mahoning & Shenango Railway & Light Company, the merged lines of the Mahoning & Shenango Valley Traction.

Detroit United Railway.—This company is negotiating for the purchase of the Windsor & Tecumseh Electric Railway, of Walkerville, Ont. The possession of this road would give the Detroit United control of all the traction properties in the neighborhood of Windsor, Ont.

Topeka Eskridge & Council Grove Railway.—New York capitalists have opened negotiations for the purchase of all the rights and property of this road, which was planned to connect Topeka and Council Grove, Kan. Chas. K. Holliday, of Topeka, is president of the company.

Hudson Valley Railway (Glens Falls, N. Y.)—This company has recently elected officers as follows: James H. Caldwell, of Troy, president; Peter McCarthy, of Troy, first vice-president; Frank E. Howe, of Troy, second vice-president; Frederick F. Pruyn, of Glens Falls, treasurer.

Calumet Electric Street Railway (Chicago).—Ira M. Cobe, of the firm of Cobe & McKinnon, of Chicago, which recently secured control of this property, has been appointed receiver, in place of E. A. Potter. It is expected that plans for reorganizing the property will be announced in a few days.

Chattanooga (Tenn.) Railway.—This company has filed a mortgage to secure $3,000,000 of five per cent bonds, of which $1,375,000 will be used immediately for betterments and additions. D. J. Duncan, general manager, is quoted as saying that the company will practically rebuild all of its lines.

Torrington & Winchester Street Railway (Winsted, Conn.).—This company, which was recently purchased by the Consolidated Railway Company, has elected officers as follows: President, C. S. Mellen; assistant president, T. E. Brynes; vice-president, Calvert Townley; treasurer, A. S. May; secretary, J. G. Parker.

Fort Dodge Des Moines & Southern Interurban Railway.—This company, which is building a road from Fort Dodge to Des Moines, Ia., has filed a mortgage on its entire property in favor of the Old Colony Trust Company, of Boston, to secure an issue of $2,150,000 of 4½ per cent 25 year gold bonds. Homer Loring of Des Moines is president.

Northern Electric Company (Sacramento, Cal.).—This company has taken out a trust deed covering all its property as security for a mortgage of $6,000,000. The loan has been negotiated to enable the company to extend its electric lines in northern California. Harry A. Butters is president and David S. Edwards, secretary of the company.

Indianapolis & Cincinnati Traction Company.—Charles L. Henry, of Indianapolis, receiver for this company, has been authorized by the court to issue $900,000 of receiver's certificates to pay for the completion of the Rushville-Connersville and the Shelbyville-Greensburg extensions. The certificates will bear interest at 6 per cent and will fall due August 1, 1907.

Mohawk Valley Company.—Announcement is made of the increase of the capital stock of this company from $10,000,000 to $20,000,000. This company is the operating company of the trolley lines which have been purchased in recent years by the New York Central, including the Utica & Mohawk Valley, the Syracuse Rapid Transit and the city lines of Rochester, N. Y.

Hudson Pelham & Salem Electric Railway (Hudson, N. H.).—Robert G. Doe, of Dover, has been appointed co-receiver of this property with D. A. Belden, of Haverhill, president of the New Hampshire Electric Railways, who has been receiver for some time. Mr. Doe will make an independent examination of the property to determine as to the advisability of rebuilding it.

Michigan United Railways (Jackson, Mich.).—This company, which operates the interurban roads between Jackson and Kalamazoo, and Lansing and St. Johns, and the Kalamazoo and Lansing city lines, has arranged for a deed of trust to the Knickerbocker Trust Company of New York, securing an issue of $7,500,000 5 per cent first mortgage gold bonds, payable in 30 years, authorized by the directors last April; $4,000,000 of the bonds have already been issued, $2,000,000 will be used for expenses, $500,000 on the power plant of the Jackson and Lansing line, and $1,000,000 on the road.

Pottstown & Reading (Pa.) Street Railway.—It is reported that this road has passed into the hands of C. Taylor Leland and other Philadelphia capitalists. It is understood that the line will be extended from Saratoga to Royersford and made a part of the system to be built to Sixty-third and Market streets, Philadelphia, by way of Valley Forge and Lower Merion.

Kanawha Valley Traction Company.—This company, of which W. C. Sproul, of Chester, Pa., is president, has purchased the Camden Interstate Traction Company, operating between Huntington, W. Va., and Ashland, Ky., 30 miles, and serving the cities of Huntington, Central City, Kenova, Ceredo, Cattlettsburg, Ashland and Ironton. The company also owns Clyffside Park, Camden Park and the Ironton Ferry.

Suffolk Traction.—This company, recently incorporated to build a line from Brookhaven to Babylon, L. I., has elected the following officers: Thomas L. Hughes, Brooklyn, president; Henry Siebert, Brooklyn, vice-president; J. G. Balmanho, secretary and treasurer; executive committee, C. L. Rossiter, Brooklyn; Thos. L. Hughes, Henry Siebert, D. H. Valentine, Brooklyn; and W. H. Jaycox, Patchogue, N. Y.

Allen Street Railway (South Bethlehem, Pa.).—A certificate has been issued by the state department of Pennsylvania showing the consolidation under the above name of the following street railways all covering the territory between Nazareth and Alliance, Pa.: Bethlehem & Bath, Bethlehem & Siegfrieds, Nazareth & Bath, Cement Belt, Alliance Bath & Nazareth, Alliance & Bath, Township Line & Allen.

Metropolitan West Side Elevated Railway (Chicago).—It is reported that this company is interested in the new amusement park to be known as Vanity Fair, which is to be located at Forty-eighth avenue and west Harrison street, the company's terminus. It is said that the elevated company will contribute toward the $500,000 which the promoters, local and Eastern capitalists, are raising to commence the work. An option on a 20-acre tract of land has been secured.

Texarkana Traction Company.—This company and the College Hill Traction Company, which operate a street railway system in Texarkana, Tex., were sold at public auction last week for $125,000, to satisfy the claims of the bondholders. The purchaser was L. S. Mitchell, of St. Louis, one of the bondholders. The plans of the purchaser are not known, but the property will be managed temporarily by E. J. Spencer, president of both companies and receiver for the property.

Springfield & Xenia Traction Company.—The bondholders' committee has decided upon a plan for a reorganization of the company to take effect about October 1. It is proposed to issue $300,000 5 per cent preferred stock and a like amount of common stock, the preferred stock to be convertible par for par in first mortgage 5s when the net earnings reach $20,000 per annum. The new securities are to be distributed pro rata among the holders of the certificates of deposit which were given for the company's bonds.

Hartford (Conn.) & Springfield Street Railway.—The directors have voted to increase the capital stock by issuing 850 additional shares of 6 per cent preferred stock, redeemable at 110. It was also voted to make a supplementary purchase of the additional rights of the Rockville Bound Brook & East Windsor Railway Company for $50,000. The following officers were elected: President, W. A. Tucker, Boston; treasurer, Chauncey Elbridge, Boston; secretary, Judge Arthur Parkins, Hartford; superintendent, H. S. Newton, Warehouse Point.

Chicago City Railway.—This company has negotiated a loan of $3,000,000 for two years at 5 per cent from a syndicate of local banks for the purpose of improving the South Side lines. The money is to be used as follows: New cars, $650,000; converting to electric power, etc., $600,000; purchasing power during negotiations with the city, $750,000; building substations for power and equipping old cars, $800,000; incidentals, $200,000. Until permanent arrangements with the city are completed the company will purchase its power from the Chicago Edison and the Commonwealth Electric companies.

Philadelphia (Pa.) Rapid Transit Company.—It is announced that the Philadelphia Rapid Transit Company has acquired under a long term lease the properties owned by the Philadelphia Morton & Swarthmore Street Railway Company and the Media Middletown Aston & Chester Electric Railway Company. The total mileage of the two roads is about 25 miles. The leases run for a term of 999 years each. The Philadelphia Morton & Swarthmore has a capital stock of $600,000 of which $250,000 has been issued. The Media Middletown Aston & Chester has a capital stock of $250,000 of which $205,300 has been issued.

Citizens' Railway & Light Company (Fort Worth, Tex.).—It is officially announced that the deal has been completed by which the Fort Worth & Arlington Heights Traction Company, the Fort Worth & Rosen Heights Street Railway and the Citizen's Light & Power Company, all of Fort Worth, are to be consolidated under the above name by Cleveland capitalists. Warren Bicknell, of Cleveland, formerly president of the Lake Shore Electric Railway, is to be president of the new company, and it is announced that extensive improvements are to be made in the equipment and service and that new lines are to be built.

Chicago & Milwaukee Electric Railroad.—Gross earnings for the six months ended June 30 were $331,872, an increase over the corresponding period of 1905 of $119,899. During the same period net earnings increased $80,123. Net earnings in June were $57,300, as compared with $30,951 in June, 1905. The increase was $26,348, or more than 80 per cent. The income account for June and for the six months ended June 30 compare as follows:

	Gross earnings.	Operating expenses.	Net earnings.
June, 1906	$84,553	$27,255	$57,300
June, 1905	53,217	22,266	30,951
Increase	$31,337	$ 4,989	$26,348
Jan. to June inclusive, 1906	331,872	143,793	188,079
Jan. to June inclusive, 1905	211,973	104,016	107,956
Increase	$119,899	$39,776	$80,123

Toledo & Western Railway.—The stockholders' committee, which is collecting the stock of the company and depositing it with the Citizens' Savings & Trust Company of Cleveland for sale to the syndicate headed by J. R. Nutt, has succeeded in securing only about 75 per cent of the stock as yet. The time for depositing the stock expired August 1, but has been extended 10 days. If within this period all the stock is not secured it is probable that proceedings will be started for a judicial sale. Judge R. W. Taylor, of the United States circuit court at Toledo, has ordered that all claims against the company be filed not later than September 1. Charles F. Franklin, of Toledo, is the receiver

RECENT INCORPORATIONS.

Cross Island Traction Company.—Incorporated in New York to build a street railroad. Capital stock, $500,000. Incorporators: James T. Wood, Sayville, L. I.; F. F. K. Morris, Henry C. Wicker and others, of New York, N. Y.

Rapid Transit Power Development Company.—Incorporated at Albuquerque, N. M., to build a line out of Albuquerque which will eventually be extended to Bernalillo and Belen, N. M. Capital stock, $500,000. W. H. Greer, of Albuquerque, is president.

Cape Shore Railway.—Incorporated in Maine to build a street railway in South Portland, Me. Capital stock, $36,000. Incorporators: L. M. Leighton, Jabez True, Norman True, C. B. Dalton, of Portland, Me.; and E. C. Reynolds, South Portland.

Pensacola Electric Company.—Incorporated at Portland, Me., for the purpose of constructing, operating and maintaining railways operated by steam or other power. Capital stock, $1,300,000. President, Charles M. Frummond of Portland; treasurer, John C. Rice, Boston, Mass.

Tuscarora Traction Company.—Incorporated in New York to build an electric line from Addison to Jasper, Steuben county, a distance of 18.5 miles. Capital stock, $500,000. The directors include Thomas E. Harden of Addison, George R. Brown and John M. Connelly of Elmira.

Putnam & Westchester Traction Company.—Incorporated in New York with a capital stock of $75,000, to construct an electric line between Peekskill, Westchester county, and Oregon, Putnam county. The directors are. J. S. Ladd and Anthony L. Ehard of Peekskill, and Walter A. Perry of Putnam Valley.

Greensburg & Latrobe Street Railway.—Incorporated in Pennsylvania to construct a line 10 miles long from Latrobe to Greensburg. Capital stock $60,000. President, Steven Stone of Pittsburg. Directors, William A. Stone, A. P. Meyer, A. M. Godfrey of Pittsburg, and N. Slenker of Wilkinsburg.

Rock City Railroad—A reorganization of the Olean Rock City & Bradford Railroad Company running between Olean, N. Y., and Bradford, Pa., a distance of 20 miles. Incorporated with a capital stock of $100,000. The directors include Chas. V. Nellany, Oscar F. Corgi and Albert W. Hartung, Buffalo.

Eastern Oregon Railroad & Power Company.—Incorporated in Oregon to build a railroad from Sumpter, Ore., to a point on the Columbia river between Umatilla and The Dalles, and from Sumpter to a point on the Snake river near Huntington. Capital stock, $25,000. Incorporators: W. E. Hurd, Anthony Mohr and P. J. Bannon.

Wheatland Street Railway.—Incorporated in Pennsylvania to build an electric line through the streets of Wheatland, Mersher county. Capital stock $6,000. R. Montgomery of Youngstown, O., is president. The directors are: Charles Beckman, Sharon; M. E. McCaskey and W. T. Burns, New Castle, and S. C. Rogers, New Bedford, Pa.

California Midland Railway (San Francisco, Cal.)—Incorporated in California to build an electric railway from Marysville, York county, Cal., northeasterly to Nevada City, thence south to Auburn, about 70 miles. Capital stock, $3,000,000. Incorporators: John Martin, Eugene J. De Sabla, Leo H. Susman, Lawrence W. Pryor and Walter J. McLean.

East St. Louis Granite City & Alton Suburban Railway (East St. Louis Ill.)—Incorporated in Illinois to build a road from East St. Louis to Alton and Edwardsville, Ill. Capital stock, $2,500. Incorporators and first board of directors: L. C. Haynes, G. C. Pierce, T. W. Gregory, F. H. Thomas, all of East St. Louis, and F. E. Allen of St. Louis.

Kalamazoo Gull Lake & Northern Railway.—Incorporated in Michigan with a capital stock of $200,000 to build a line from Kalamazoo to Richland and Prairieville, Mich., with a branch extending to Gull Lake. The road is to be operated by electricity, gas, or compressed air or other motive power, and will be about 20 miles in length. The stockholders are: James T. Upjohn and H. K. Whitney, of Kalamazoo; A. A. McKay and S. A. Howes, of Battle Creek; and Albert H. Brown, Martin P. Huyck and Edward D. Hosemer, of Chicago.

Lorain Street Railroad (Lorain, O.).—Incorporated in Ohio to consolidate the Lorain Street Railway and the Avon Beach & Southern, with a capitalization of $250,000; $750,000 of bonds, guaranteed by the Lake Shore Electric Railway, of Cleveland, are to be issued for improvements, including the double-tracking of the Lorain Street Railway from Lorain to Elyria.

Spokane Yakima West Coast Limited Railway (Spokane, Wash.)—Incorporated in Washington to build and operate steam and electric railways, deal in real estate, develop water power, and build and operate electric power and lighting plants. Capital stock $5,000,000. Incorporators: D. H. Buttz, S. M. Wharton, John Sengfelder, James Durkin, J. W. Oakes and M. N. Knuppenburg.

West Coast Traction Company.—Incorporated in Washington for the purpose of constructing and operating steam or electric railway lines in the state of Washington. Capital stock, $75,000. Incorporators, C. H. Weeks of Spokane; B. J. Weeks, Tacoma; D. D. Levenson, London, England; Cyrus Bradley, Spokane; J. W. Reynolds, Chehalis, and F. B. Hubbard and W. W. Cannon of Centralia.

Frontier Electric Railway.—Incorporated in New York to build an electric railway 25 miles long between Niagara Falls and Buffalo, N. Y. Capital stock, $300,000. Incorporators: H. G. Ramsdell, S. Ellis and W. Aspinwall, Buffalo. This is a subsidiary company of the International Railway Company of Buffalo, and when completed will give that company a four-track line from Buffalo to the Falls.

Lafayette & Chicago Railway Company.—Incorporated in Illinois to build an electric line from Lafayette, Ind., to Chicago, Ill., through the towns of Rensselaer, Crown Point and Hammond. Capital stock $25,000. Incorporators: George Winfield, W. A. Hennegar, James M. Leatherman, Robert Parker, Urban C. Mallon, Charles Coen, Stephen T. Comer, John A. Schaffer, Elmer E. Tyner and George F. Meyers.

Rochester-Corning-Elmira Traction Company.—Incorporated in New York to build from Rochester to Elmira, N. Y., through Monroe, Livingston, Steuben and Chemung counties, a distance of 120 miles. Capital stock, $4,000,000. Incorporators: Max H. Schultze, C. O. Geer, Frederick Eckstein, Samuel M. Levy, Henry Brunssen, Harry Velthusen, Horace G. Abel, Henry H. Kaufman, and Tracy S. Breckingham, of New York, N. Y.

St. Joseph & Southern Railway.—Incorporated in Missouri to build an electric road from Kansas City to St. Joseph, passing through Jackson, Clay, Platte and Buchanan counties, a distance of about 50 miles in approximately an air line. Capital stock, $500,000. Incorporators: John Donovan, John D. Richardson, N. D. Biles, Edward C. Smith, J. G. Schneider, Henry Krug, Jr., Jesse I. Roberts and James N. Burns, all of St. Joseph, Mo.

Chicago & Western Indiana Traction Company.—Incorporated in Indiana to build an electric line through Lafayette, Crawfordsville, Greencastle and Bloomington, Ind. Right of way has been secured between Lafayette and Greencastle, it is stated, and most of the capital stock has been subscribed. Capital stock, $100,000. Officers: Edward H. Barrows, president; D. W. Bolan, vice-president; John S. McCullough, secretary and treasurer, all of Indianapolis.

North St. Louis & Suburban Railway.—Incorporated in Missouri to build an electric railway in St. Louis on Hall's Ferry road from Broadway to the city limits, with a possible extension to Jennings and Ferguson. A franchise has been granted for the line within the city and construction is to start within 30 days. Capital stock, $50,000. Incorporators: John Scott, James Scullin, Edward J. Scott, John R. Scott, Thomas W. Murphy, William Scullin and John Scullin.

Westinghouse Consolidated Foundries Company, Pittsburg, Pa., has been incorporated by George C. Smith, Walter D. Updegraff and E. D. Seltz to take over and consolidate the various Westinghouse foundries now located at Pittsburg, Allegheny City, Cleveland and Attica, N. Y. A new foundry is to be located at Trafford City, near Pittsburg, where 20 additional acres have been secured. It is stated that seven new buildings will be erected as soon as possible.

Danville & Eastern Illinois Railroad.—Incorporated in Illinois by the Illinois Traction System to construct an electric road from Danville east through Vermillion county to the Indiana state line, to connect that company's system in Illinois with the various traction lines in Indiana, by means of the Indianapolis Crawfordsville & Western Traction Company's line, now under construction west from Indianapolis. Capital stock, $5,000. Principal office, Champaign, Ill. Incorporators: Geo. M. Mattis, Chas. A. Wright, W. H. Burke and Chas. Zilly of Champaign, and J. E. Johnson of Danville.

Weatherford Interurban Railway & Light Company.—This company has been granted a territorial charter in Oklahoma to build four lines out of Weatherford, each one 75 miles long. The first line extends northwest to Taloga in Dewey county; the second west through Custer and Roger Mills counties to Cheyenne; the third southwest through Custer, Washita and Kiowa counties to Hobart; and the fourth southeast through Custer, Washita and Caddo counties to Anadarko. Capital stock, $50,000. Incorporators: Dr. Robert X. Wade, Charles Penn, A. P. Sights, W. P. Fowler and W. W. Brown, all of Weatherford

ROLLING STOCK

Northwestern Elevated Railroad, Chicago. has contracted with the Jewett Car Co. for 34 new motor cars.

Quebec Railway Light & Power Company has ordered 25 flat cars of the Rathbun Company, Deseronto, Ont.

Chattanooga Railways Company, Chattanooga, Tenn., has ordered two additional cars from J. G. Brill Co.

Canyon City Florence & Royal Gorge, Canyon City, Colo., is having cars built by the St. Louis Car Company.

Dallas Interurban Electric Railway, Dallas, Tex., is in the market for considerable equipment including rolling stock.

Pittsburg Railway & Light Company, Pittsburg, Kan., has ordered six double truck cars of the St. Louis Car Co.

Springfield Gas & Electric Company, Springfield, Mo., expects to place an order very soon for several new cars, probably six.

Hamburg Railway, Buffalo, N. Y., has ordered 15 cars of the G. C. Kuhlman Car Co. and 15 from the Cincinnati Car Co.

Oskaloosa Traction & Light Company, Oskaloosa, Ia. is said to have purchased three trailers from the Twin City Rapid Transit Company.

Central Illinois Construction Company has ordered two electric locomotives from the American Locomotive Company and the General Electric Company.

Elmira Water, Light & Railroad Company, Elmira, N. Y., is in the market for one double-truck baggage car and one double-truck snow plow for single track interurban road.

Kansas City & Westport Belt Railway has ordered one direct current electric locomotive to be built by the General Electric Company and American Locomotive Company.

El Paso Electric Railway is about to place an order for four cars of the California type. Stone & Webster, 84 State St., Boston, Mass., are general managers for the company.

Cleveland & Sharon Electric Railway has contracted with the G. C. Kuhlman Car Co. for six interurban coaches, two combination mail cars and two box freight cars, each 52 feet in length.

Anniston Electric & Gas Company, Anniston, Ala., has purchased four 20-foot closed cars and two ten-bench open cars from the Southern Car Company. Delivery of all this equipment will soon be made.

Utah Light & Railway Company, Salt Lake City, has ordered an electric locomotive from the Westinghouse Electric & Manufacturing Company, and five 28-foot passenger cars from the St. Louis Car Company.

Indianapolis Crawfordville & Western Traction Company will shortly be in the market for electric cars. The Electrical Installation Company, Monadnock block, Chicago, has charge of the construction and equipment of the road.

Indianapolis Newcastle & Toledo Electric Railway, the construction and equipment of which is in the hands of the Electrical Construction Company, Monadnock block, Chicago, will shortly be in the market for about ten interurban cars.

Spokane & Inland Railway, Spokane, Wash., has purchased from the St. Louis Car Company fifteen standard city cars of the St. Louis and St. Paul type with large rear platforms. Some of these cars have already been delivered.

Sao Paulo Tramway Light & Power Company, of Rio de Janeiro S. A., has contracted with the McGuire-Cummings Manufacturing Company for 4 double-truck pneumatic sprinklers, each car to be equipped with a tank of 4,000 gallons capacity.

Illinois Traction System is having 55 cars built by the American Car Company and the St. Louis Car Company which will be all that will be ordered for the present. The company is said to be building at its Springfield shops a new refrigerator car for use on its lines.

Indiana Columbus & Eastern Traction Company, Columbus, Ohio, which was recently incorporated as a consolidation of 350 miles of electric roads controlled by the Schoepf-McGowan syndicate, is reported as soon to place contracts for considerable additional rolling stock.

Japanese Railways are said to have placed contracts with J. G. Brill Company for considerable equipment including five cars for the Kinshin Railway, these latter to consist of one private car, one dining car, one sleeping car and two coaches. It is stated that all of these will have steel underframes and will be delivered early next year.

Western Electric Company has contracted with H. K. Porter Company for a complete compressed air haulage plant for its lumber yard at Chicago. The compressor for this plant will be operated by an electric motor. The locomotive will be standard gauge with 9½ by 14-inch cylinders; weight, 28,000 pounds; storage capacity, 160 cubic feet, developing 5,760 pounds tractive force.

United Railroads of San Francisco are now receiving 50 cars from the American Car Company, being those originally built for the Chicago City Railway, and will receive this month 12 interurban coaches being built by the St. Louis Car Company for the Philadelphia & Western. An order has just been placed with the St. Louis Car. Co. for 100 additional cars and there is talk of ordering another 150.

TRADE NOTES

Ohio Brass Company, Mansfield, O., has appointed as traveling salesman for Indiana, Ohio and Michigan, H. G. McDuffy, formerly connected with the Chicago office of the Railway Steel Spring Company.

Charles C. Miller, for many years connected with the Westinghouse Air Brake Company, and later treasurer of the Peerless Rubber Company, died at Long Branch, N. J., on July 17, at the age of 65 years.

Electric Service Supplies Company has opened offices at No. 922 Missouri Trust Building, St. Louis, Mo., in charge of Ernest Boehme, and a full line of samples of the company's various specialties will be carried.

Recording Fare Register Company, New Haven, Conn., has recently removed its factory to larger and more convenient quarters at 106 Park street, New Haven, a step made necessary by the large increase in the company's business.

Pittsburg Gauge & Supply Company, Pittsburg, Pa., announces that W. H. Schobie, formerly assistant purchasing agent of the Big Four Railroad at Cincinnati, O., has resigned and has accepted a position as purchasing agent for the company.

Halifax & Suburban Railway Construction Company, Boston, Mass, has been incorporated with $50,000 capital stock to build steam and electric railways. President, Harvey E. Harding, Waltham, Mass.; treasurer, Gideon H. Haskell, Hyde Park, Mass.

Loring Coes died at Worcester, Mass., on July 13 at the age of 94 years. He was born in Worcester and learned the machinist's trade. He was the original inventor of the Coes wrench and until recently was president and treasurer of the Coes Wrench Company.

Arlington Manufacturing Company, Canton, O., has organized a railroad department, with headquarters at 17 State street, New York, and has appointed William B. Wheeler general sales manager. The company reports an increasing business with railroads and states that its paint specialties are already in use on a number of prominent trunk lines.

Independent Pneumatic Tool Company, Chicago, has appointed Lake, Hale & Co., 11 Front street, San Francisco, Cal., its Pacific coast representatives. This firm will carry in stock the Thor piston air drills and reamers, reversible flue rolling, tapping and wood boring machines, pneumatic riveting, clipping, calking and beading hammers, etc., manufactured by the company, which reports a large number of orders during the past few weeks from Pacific coast states.

Hurd & Haggin, 316 Hudson street, New York, is placing upon the market a new anti-friction metal known as Fahrig metal. The firm is a manufacturer of gasoline engines for marine and railway purposes and has developed this metal in connection with the tests of its engines. It states that this metal is now used by the Chicago Terminal and a large number of manufacturing and contracting firms. It is composed essentially of tin and copper and contains no lead, zinc or antimony.

Dossert & Company, New York, N. Y., reports recent large orders for the Dossert solderless wire and cable connectors from the Metropolitan West Side Elevated Railway, of Chicago, the Interborough Rapid Transit Company, of New York, the Brooklyn Rapid Transit Company, the Pittsburg Railways Company, the Indianapolis Traction Company, the Pennsylvania Railroad, the South Chicago Traction Company, and a large order for a special connector of 35,000 pounds tensile strength for bonds for the New York Central Lines.

Westinghouse Machine Company, East Pittsburg, Pa., has received an order from the Public Service Corporation of New Jersey for two 1,000-kilowatt and one 500-kilowatt Westinghouse-Parsons steam turbines. The first two will be installed in the plant at Cooper's creek, Camden, N. J., and the third at Cranford, N. J. The plant at Cooper's creek will burn soft coal under six 500-horsepower Sterling consolidated water-tube boilers of the Babcock & Wilcox type and will use Foster superheaters and the Williamson condensing system.

Allis-Chalmers Company, Milwaukee, Wis., has been organizing its new department for the manufacture of the Christensen air brakes. Mr. J. H. Denton, formerly general superintendent of the National Brake & Electric Company, has been engaged as manager of the air-brake department. The entire second floor of the north shop of the Reliance works at Milwaukee, now occupied by the company's general offices, will be devoted to the manufacture and assembling of air brake equipments. The company announces the removal of its Denver, Colo., office to the McPhee Building, 17th and Glenarm streets, and of its El Paso, Tex., office to the Guarantee Trust Building, rooms 301-306.

Roberts & Abbott Company, Cleveland, O., has opened an office in the Title Guarantee building, Birmingham, Ala., which will have charge of the engineering work of the Tidewater Development Company, at present consisting of a location survey for their proposed electric railway to connect Gadsden and Tuscaloosa, through Birmingham, Ala., a distance of approximately 120 miles, and plans and specifications for the power and equipment. Mr. William H. Searles, well known as the author of "Searles' Engineering Hand Book," "Searles' Railway Spiral," etc., is in charge of the civil engineering, and Mr. E. F. Enslen, who has had an extended experience in the design and construction of electric railways, is in charge of the mechanical and electrical work. A large and competent force of assistant engineers is being organized and the Birmingham office is now in position to take charge of engineering work of any character.

Railway Steel Spring Company has appointed to a position in its sales department George M. Burns, heretofore division superintendent of the Wabash, at Detroit. Mr. Burns will have his headquarters in New York City.

Price Publishing Company, Lima, O., which makes a specialty of electric railway maps and guides, has just published an excellent map showing all of the electric roads in Ohio, Indiana and Michigan in heavy lines and the steam roads at terminals in light lines. The map is strictly up to date in every particular and is printed on muslin-backed paper, 35x38 inches, suitable for mounting. The same map is also published in vest-pocket style on light paper, 14x18 inches. The price of the large map is $3.00, and of the small map $.15, f. o. b. Lima.

Charles Addison Bragg, district office manager of the Westinghouse Electric & Manufacturing Company, Philadelphia, Pa., died at that place on Sunday, July 29th, after an illness of over two months' duration. Mr. Bragg was one of the pioneers in the electrical business, having been associated with the United States Electric Lighting Company as early as 1882. His connection with the Westinghouse Electric & Manufacturing Company began in the year 1889, when he was appointed manager of the Philadelphia office, which position he filled successfully up to the time of his death.

General Electric Company has received an order from the United Railroads of San Francisco for 25 4-motor 40-horsepower equipments, 15 4-motor 50-horsepower equipments and 10 4-motor 75-horsepower equipments, all to be supplied with the flexible Sprague-General Electric system of multiple unit control; also an order from the United Traction Company of Albany, N. Y., for 25 4-motor equipments; Philadelphia Rapid Transit Company 100 4-motor equipments and the St. Louis Railway Company 36 4-motor equipments. The company calls attention to the fact that these 40-horsepower equipments are being widely adopted for railway work and in many cases are supplanting motors of other types.

Auxiliary Office Lighting Equipment at Quincy, Ill.—The Quincy Horse Railway & Carrying Company of Quincy, Ill., has recently installed at its power plant an engine and generator of sufficient capacity to furnish current for 150 incandescent lamps. This installation was provided in order to furnish light for the company's buildings between the hours of 12:30 and 5 a. m. during which time the main power plant is not operated. The new equipment consists of a Bayley upright engine of 10-horsepower capacity direct connected to a Northern Electric 11-ampere, 550-volt generator. The current generated is fed to the trolley wire which distributes it to the company's offices and barns several blocks away.

The Link Belt Company is the new name of the Link Belt Machinery Company, of Chicago, which has purchased the plants and all other assets of its associate companies, the Link-Belt Engineering Company, of Philadelphia, and the Ewart Manufacturing Company, of Indianapolis. The company was organized in 1880 to manufacture labor-saving appliances, employing the products of the Ewart Manufacturing Company. In 1882 a branch office was organized in New York, and in 1888 this branch of the business had grown to such an extent that it became necessary to have a manufacturing plant in the east, and in that year the Link Belt Engineering Company, of Philadelphia, was organized. The new company will continue the manufacture of conveying, elevating and transmission machinery, malleable and machine-made driving chains, etc. It has plants in Chicago, Indianapolis and Philadelphia. Its officers are: Chairman of board, James O. Dodge, Philadelphia; president, Charles Piez, Philadelphia; first vice-president, Glenn G. Howe, Indianapolis; second vice-president, Staunton B. Peck, Chicago; treasurer, S. Howard Smith, Philadelphia; assistant treasurer, P. G. Reid, Philadelphia; secretary, Dyke Williams, Chicago; assistant secretary, Edward H. Burr, Philadelphia.

Westinghouse Electric & Manufacturing Company has issued a statement of its earnings for the past six years ending March 31, 1906. Comparisons of sales of the company for fiscal years ended March 31 follow:

1901	$12,516,072	1904	$18,569,614
1902	17,927,339	1905	16,570,717
1903	19,571,295	1906	24,939,602

The full report for the six years ending March 31, 1906, shows:

Gross earnings	$114,618,637
Shipments	97,726,008
Net earnings	16,892,529
Other income	1,074,718
Interest, etc., on stock owned	1,679,333
Miscellaneous	910,540
Total net income	$ 20,557,119
Deductions	7,079,650
Balance	$ 13,477,466
Surplus for year	3,570,015
Premium on stock issue	4,415,230
Gross surplus	$ 21,462,711
Dividends paid during six years	9,992,069
Total surplus	$ 11,540,642

The meeting of the stockholders was held on July 25 at Pittsburg. The old board of directors was re-elected with the exception of James Hazen Hyde, who is succeeded by T. W. Simeon, and Frank H. Taylor, who is succeeded by W. D. Updegraff.

ADVERTISING LITERATURE

Bristol Company, Waterbury, Conn.—A pamphlet illustrating and describing Bristol recording gauges.

National Brake Company, Ellicott Square, Buffalo, N. Y.—Several circulars and pamphlets describing the Peacock brake.

Hurd & Haggin, 312 Hudson street, New York.—A pamphlet explaining the merits of Fahrig anti-friction metal for all kinds of bearings.

Sterling-Meaker Company, Newark, N. J.—This company is distributing a 30-page catalogue illustrating and describing five modern fare registers for electric cars.

Cincinnati Manufacturing Company, Cincinnati, O.—An illustrated catalogue of conductors' and ticket punches. The company states that it is the largest maker of punches in the world.

Yale & Towne Manufacturing Company, New York.—"The Ghost and the Burglar" is a story intended to impress upon the reader the strong points of the Yale locks made by the company. Twenty-four pages, 2½ by 4½ inches.

Peter Smith Heater Company, Detroit, Mich.—An illustrated catalogue of the Peter Smith hot water heating system as applied to electric railway cars; 32 pages, 7x10 inches, printed on enameled paper with three colors of ink and filled with exceptionally fine halftone illustrations.

Allis-Chalmers Company, Milwaukee.—Bulletin No. 1503 illustrates and describes direct connected type of Allis-Chalmers Reliance-Corliss engines.—Bulletin No. 1411 has 48 pages and is devoted to rock crushing plants. It is 8 by 10½ inches with perforated back similar to the other bulletins of the company.

Buda Foundry & Manufacturing Company, Chicago.—A catalogue of 32 pages, 6 by 9 inches, describing Buda scales, including railroad track scales, coal hopper scales, depot scales, etc. The catalogue is printed in two colors on enameled paper and describes in detail the construction, capacity and price of various scales.

Commercial Truck Company of America, Philadelphia.—An interesting catalogue 10x7 inches illustrating and describing electric street vehicles and trackless trolley cars, has just been issued by this company. The company is prepared to supply all types of commercial vehicles of from two to twelve tons carrying capacity, radius under one charge from 30 to 75 miles.

Electric Storage Battery Company, Philadelphia, Pa.—Bulletin No. 99 explains the application of storage batteries in railway electric signal and interlocking devices. Bulletin No. 100 is devoted to the application of storage batteries to railway car lighting. Views are shown of Santa Fe, Northern Pacific, and other cars that use the chloride accumulator for electric lighting.

Westinghouse Electric & Manufacturing Company, Pittsburg, Pa.—Circular No. 1134 illustrates and describes electrical and mechanical brakes for Westinghouse type K motors. The Westinghouse company has recently issued a booklet in Spanish entitled "Industrias Y Productos De Westinghouse" in which are described and illustrated many of the Westinghouse products.

Underfeed Stoker Company of America, Marquette Building, Chicago.—A pocket edition catalogue has been issued by this company, which is the sole manufacturer of the Jones underfeed mechanical stoker, now in quite general use in electric railway and other power plants throughout the country. This catalogue is printed in two colors and has about 60 large illustrations. The company has an eastern office in the Board of Trade building, Boston, and sales offices in eleven other cities.

General Electric Company.—This company has issued bulletins No. 4441, 4442, 4444, 4445 and 4448, describing and illustrating type H subway transformers, GE-87 railway motors, direct-current, motor-driven air compressors, direct-current Curtis steam turbine generators and small polyphase motors; also supply catalogue No. 7598 of parts of plain type carbon feed enclosed arc lamps. Supply department flyers present descriptions and cuts of G. E. moulding rosettes and cast grid rheostats.

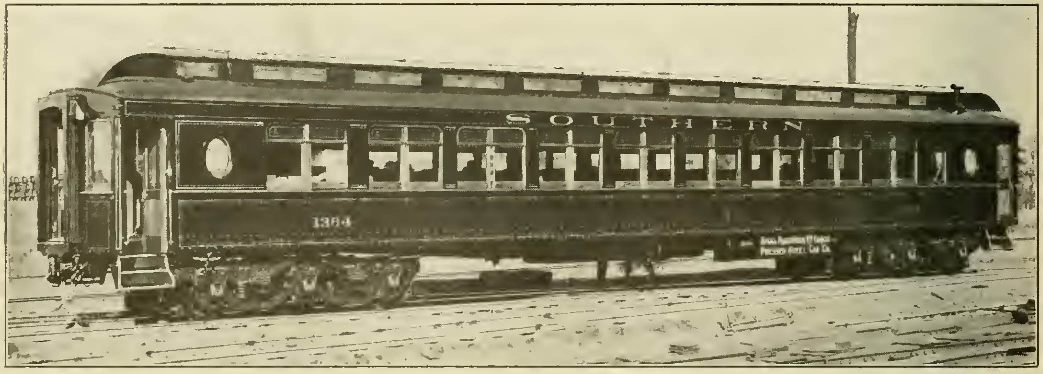
Crane Company, Chicago.—Mr. R. T. Crane has prepared an article entitled "The Abuse of Valves" in which he states that 95 cases out of every 100 leaky valves are due to abuse and carelessness on the part of those installing them, rather than to defects in the the valves themselves. This article, together with directions for the installation and care of valves, has been reprinted in the form of a poster suitable for hanging on the walls of engine rooms and shops. It is printed in two colors on heavy calendered bristolboard and contains no advertising other than the name of the publisher. It will be mailed free upon application.

American Locomotive Company, 111 Broadway, New York.—This company has issued a pamphlet illustrating and describing various types of its electric motors and trailer trucks. The pamphlet begins with a description of the designs of the motors and trucks of which 15 are illustrated by full-page drawings. The designs illustrated include motor trucks for the New York Central suburban service and also trucks for the Paris-Orleans, the Schenectady, the Delaware & Hudson, the Brooklyn Rapid Transit, the Buffalo & Lockport and other railways. The drawings show the construction in detail rendering it an easy matter to study the designs. In addition to the drawings nearly all of the trucks are illustrated by reproductions from photographs. Among the details illustrated are cast-steel and wrought-iron bolsters, truck hangers, spring planks, Brinkerhoff-Doyle wheel hubs and journal boxes with collarless and collar axles.

STEEL CAR FOR SOUTHERN RAILWAY.

The Pressed Steel Car Company, of Pittsburg, has recently built for the Southern Railway three passenger coaches of an interesting design. The general dimensions of the cars are the same as the standard coaches of the Southern Railway, and are as follows:

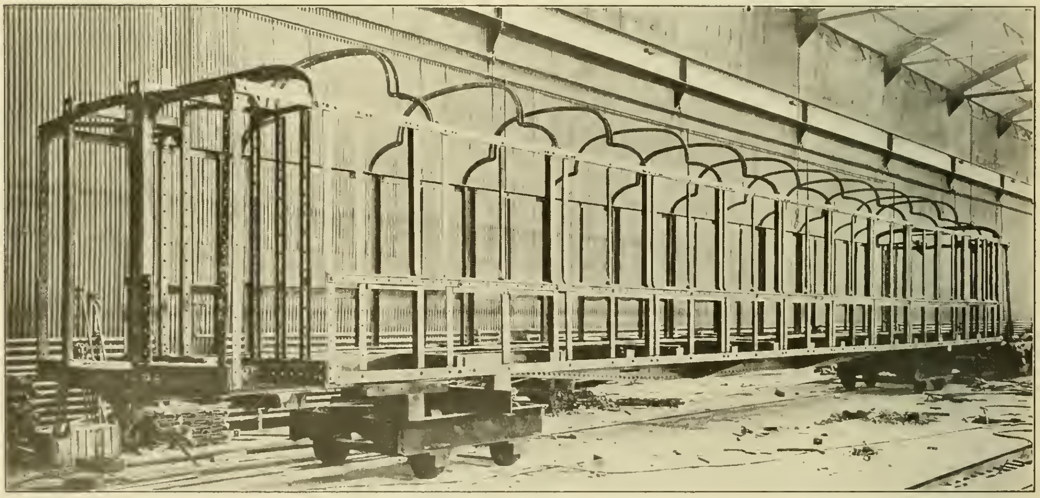
Length over platforms	74 ft. 6¼ in.
Length over body end sills	65 " 3¼ "
Total inside length	65 " 3¼ "
Distance from center to center of trucks	50 " 0 "
Width over side sheets	9 " 10¼ "
Width inside between finish	8 " 10¼ "
Height from top of rail to top of body	14 " 2 "



Pressed Steel Passenger Car—Completed Car.

The interior arrangement of seats, smoking-room, etc., corresponds to the railway company's standards. The equipment also follows the railway company's practice wherever practicable in order that repairs and interchangeability may be facilitated.

The underframe, superstructure, platforms, platform sills, body carlines, and the side sheets of the cars on the outside below the windows are made of steel in the form of plates, pressed, rolled or built-up parts, according to the requirements and the adaptability of the material.



Pressed Steel Passenger Car—Framework.

The construction of these cars has been worked out by the Pressed Steel Car Company subject to the approval of important parts by the mechanical superintendent, and the consulting mechanical engineer of the Southern Railway. While the construction as a whole, as well as in details, may be more or less changed for future similar cars, it shows a decided improvement in the right direction, namely, a car offering greater resistance to damage in accidents as well as minimizing danger to passengers in such emergency. It is understood that drawings for still further advanced types of steel passenger coaches and steel trucks are being prepared, these constructions to embody the use of non-inflammable or totally fireproof materials.

VICTOR COMBINATION METER.

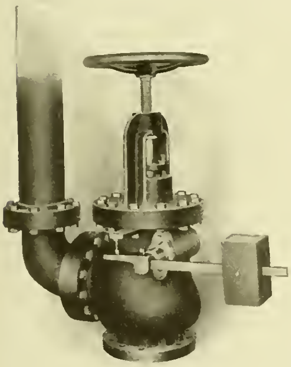
The new Victor combination meter is designed to give a simultaneous reading of volts, amperes, watts and horsepower on one dial. It is practically two separate and complete instruments in one case, each of which acts independently of the other with respect to volt and ampere readings. The readings in watts and horsepower are obtained from the point of intersection of the two indicators. It is claimed that as a wattmeter this instrument is accurate at any voltage within the limits of the volt scale. The watt scale is laid out in actual calibrations with a reliable standard which is said to insure accurate results. The horsepower scale is obtained mathematically from the watt scale.

The instrument has a wide range of uses which will suggest themselves to the practical engineer. It is claimed to be the only practical switchboard instrument which will give a reading in watts and horsepower. While combining four instruments in one it requires the space of but a single instrument and is thus adapted to the smallest switchboard panels.

The workmanship and materials employed in the manufacture of this instrument are of a high order, insuring accuracy and great durability. It is light in weight, rigid and not at all delicate and will withstand considerable vibration without having its accuracy impaired. It requires a minimum of energy to operate it, making it extremely sensitive, and is also free from magnetic lag, unaffected by temperature variations and can safely remain continuously in circuit. The meters are illuminated from the rear, thus saving space on small panels. This new instrument is being placed on the market by the H. W. Johns-Manville Company, 100 William street, New York City.

AN AUTOMATIC BOILER CUT-OFF VALVE.

A new automatic boiler cut-off valve has recently been placed on the market by the Lagenda Manufacturing Company, Springfield, O. This valve is so designed that should a header in a steam plant break or a tube burst in a boiler the action of the valve will be in the first case to immediately shut off all the boilers, and in the second case to shut off the defective boiler from the steam header. Its action does not depend upon variation in pressure, but upon the actual flow of steam through the valve.



An Automatic Boiler Cut-off Valve.

As shown in the illustration the construction of the valve is simple as it has but two moving parts. One of these is a counter balance lever which is always in plain sight and the other is a double-heat valve closing upon either side of a double seat. The upper portion of the valve is made of bronze and has a sleeve in which the small end of the stem works loosely. Normally the valve rests upon the seat and prevents steam from entering the boiler. If the boiler is shut down the valve closes automatically and remains closed while the boiler is emptied or cleaned. When steam is generated in the boiler the valve remains closed until the boiler-pressure slightly exceeds the pressure in the main when the valve is lifted. The valve is very nearly balanced by the weight and with a slight flow of steam rises to mid-position. At this point the weight strikes a rest and the valve remains in mid-position while steam is being drawn from the boiler. If a break occurs beyond the valve the excessive rush of steam will carry the upper valve up against the seat, thus shutting off the boiler. If the flow of steam is reversed the upper valve will instantly drop to its seat and shut off the main. The rate of flow at which the boiler would be shut off is determined by the weight of the valve and the distance between the two valve faces. This is adjusted to correspond to the greatest overload at which it is desired to operate the boiler, say a little over twice the normal rated capacity.

This valve has been tested in service and it is claimed that satisfactory results have been afforded. It can be used as an ordinary stop valve whenever desired.

CARBON BRUSHES.

"Carbon Brushes" is the title of an interesting practical treatise on the use of carbon brushes for electric motors and generators by J. S. Speer, president of the Speer Carbon Company, St. Marys, Pa. The writer states that no single grade of brush can be universally adopted, but that brushes of special composition must be made to meet the requirements of the various types of machines. It is possible to meet all requirements by making only three or four qualities of carbon brushes. The conditions which may be responsible for the poor performance of the brushes are briefly dealt with in the book and a list is given of the causes that may occasion sparking.

In order to present the advantages of each grade of the Speer carbon brush in a clear and comprehensive manner an elaborate series of tests has been completed recently, the results of which are summarized in a number of curves contained in the book. The data include curves obtained from the heat tests showing the various ultimate temperatures of the brushes for various current densities; brush friction tests showing the loss in power for varying peripheral speeds; the results of a test for voltage drop through brushes; brush tension tests showing the average brush drop; contact resistance tests illustrating the average brush drop and contact resistance at different current densities; tests for wattage loss showing the average friction loss at various speeds and brush tensions, and tests for coefficient of friction showing the average coefficient of friction and brush friction loss.

In conclusion the writer illustrates and describes a variety of brushes and states that the commutation and collection of current in an electric motor and generator depends to a large extent upon the quality of the carbon brush used and the means of contact provided to carry the current from the brush to the terminal. The work contains much valuable information which has hitherto been in the hands of the designing engineers and manufacturers, and which will be of much interest to the user of electrical machines.

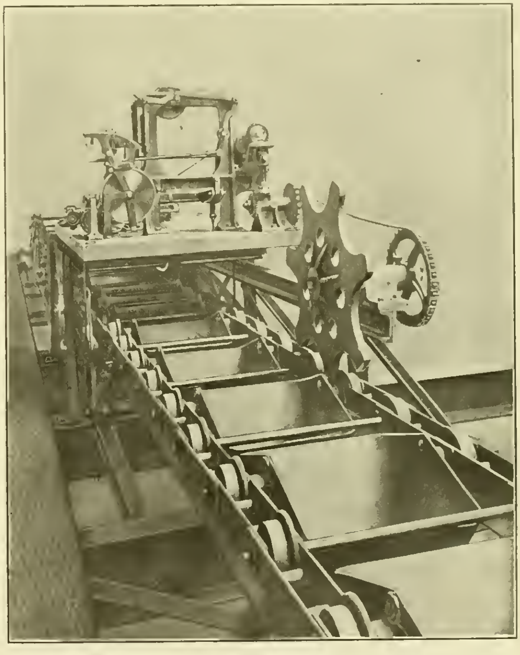
WEIGHING COAL AT POWER STATIONS.

The Blake-Denison automatic weighing machine was first introduced in connection with electric power stations at Leeds, England, for weighing the coal used at the municipal power plant. It is used equally well with bucket, belt and other types of coal carriers. The illustration shows one of the machines at the new Port Royal electric station of the Great Western Railway and a brief description of its operation will be interesting.

A section of the conveyor track, the length of two buckets, is suspended and balanced off. This balanced portion is the platform of the scale. When the conveyor is in operation the weighing machine automatically takes a weight every time the conveyor travels the suspended distance, and as the weight of the track and empty buckets is balanced off, only the aggregate net weight of the coal is recorded on the indicator. The machine is driven by the conveyor itself and therefore any change in the speed of the conveyor means a corresponding change in the frequency of the weighings. Undue oscillation of the beam, which would otherwise be caused by change of load, is avoided by a patented mercury dashpot.

The manner in which the height of the beam is transformed into figures upon a record is as follows:—

The beam takes a position according to the weight on the scale platform. It is then gripped and held in that position while a curved quadrant moves to the right until it comes into contact with the beam, the higher the beam when gripped the greater being the movement of the quadrant. The quadrant is then moved back to its normal position, carrying a ratchet wheel with it; this ratchet wheel turns on its axis a distance proportionate to the height of the beam. The beam is then released and takes a new position in accordance with the weight of the coal in the next two buckets.



Blake-Denison Coal-Weighing Machine.

This machine, which is being introduced by the Weston Engineering Company, of New York, is one of the features of the new electric power station of the New Jersey Public Service Corporation at Marion, N. J.

CLEVELAND INVESTMENTS IN 1906.

A vest-pocket book has been issued by Mulrooney & Fitzgerald, 425 Rockefeller building, Cleveland, O., which contains considerable information of value to prospective investors. There are included considerable traction statistics regarding properties financed by Cleveland capital. A table is given in which the miles of single track owned by each company, the amount of its capital including the amount in stocks and bonds, and the gross and net earnings for 1905 are listed. Elsewhere in the book is more extensive information regarding the various traction companies, including a list of the officers and directors.

DEEP-TONED AIR WHISTLES FOR INTERURBAN CARS.

Some little annoyance has been caused both passengers and dwellers in suburban towns by the shrill sound of the ordinary air whistle used on interurban cars. To do away with this annoyance a new whistle designed on the same principle as an organ pipe has recently been placed on the market by the General Electric Company.

In the past air whistles have been designed along the same lines as steam-blown whistles. It is generally known that steam whistles operated by air give a very different tone when operated by steam. This is due in part to the condensation of the steam and the resulting increase in its density as it issues from a restricted orifice. This condition will not obtain with air so that the tone of an air-blown steam whistle is harsh and shrill.

The organ type of whistle meets the requirements of air operation in a very satisfactory manner, provided the whistle is protected from outside atmospheric disturbances such as a high head wind. The whistle shown in the illustration is designed with center partitions, so located as to prevent a transverse flow of air across the ports, which would tend to distort the effective air column. The sound emitted by this whistle is deep and clear in tone and sufficiently penetrating to be heard at a considerable distance.

Deep-Toned Air Whistle.

The whistle is substantially constructed of non-corroding metal and should last indefinitely. The standard whistle operates most effectively at an average air pressure of 55 pounds per square inch. It operates satisfactorily, however, at pressures varying from 50 to 130 pounds per square inch. A convenient operating valve of the adjustable lever type is provided with this whistle.

RIDLON TROLLEY CATCHER.

The Frank Ridlon Company, 200 Summer street, Boston, Mass., is placing on the market its No. 2 Ridlon Trolley Catcher, which is illustrated herewith, and for which the manufacturer claims several advantageous features.

The parts are of malleable iron and their number has been reduced to a minimum, thus decreasing the cost of maintenance. The reel spring is amply protected from the weather by the case which is so constructed as to allow sufficient room for the reel to quickly take up the slack rope when the trolley pole is down. There is an opening in the lower part of the case through which the reel may be readily reached and the trolley rope may be unwound without taking the apparatus apart. This opening also serves as a drain for any water that may enter the case.

No. 2 Ridlon Trolley Catcher.

The manufacturers claim that when used on single-truck cars where there is considerable oscillating motion, this device will not catch and pull the wheel from the wire. When the trolley wheel leaves the wire the catcher works quickly and has an action which retards unlocking should the pole rebound. The catchers are made to fit a standard collar and are fitted with a simple locking device to keep them firmly in place.

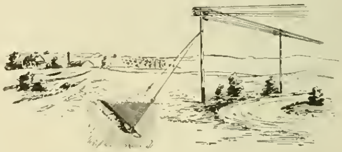
Spokane-Pend d' Oreille Rapid Transit Company.

The Spokane-Pend d' Oreille Rapid Transit Company, Limited, was incorporated last December in Washington with a capital of $2,000,000, to build an electric railway connecting Spokane, Wash., with Lake Pend d' Oreille, Idaho, a distance of 46 miles. The incorporators are all business men and capitalists who have been prominently and closely identified with the up-building of Spokane. Surveys have now been made and the entire line practically located. Many miles of the right of way have been secured and the work is rapidly progressing. The route, which passes through a prosperous farming, timber and summer resort country with a population of 100,000, includes the towns of Opportunity, Greenacres, Otis Orchards, Rathdrum, and Idlewild, and crosses the lines of the Oregon Railroad & Navigation Company, the Spokane & International Railway and the Northern Pacific Railway. Owing to light grades and curves and entire absence of rock it is estimated that this road can be built and equipped with 70-pound rails and first-class rolling stock, for a little over $1,000,000, including passenger terminals, yards, shops, 15 passenger cars, 40 freight cars, 2 electric locomotives, wharves and warehouses at the lake, and two steamers to run on the lake. Passenger and freight terminals have already been secured and a power contract calling for 500 to 1,000 horsepower at $20 per horsepower per annum for a long term of years has been arranged with the Washington Water Power Company. The officers of the Spokane-Pend d' Oreille Rapid Transit Company are: C. H. Reeves, president; J. J. Browne, first vice-president; D. K. McDonald, second vice-president; J. Grier Long, treasurer; R. A. Hutchinson, general manager; Mark F. Mendenhall, secretary.

HERCULES ANCHORS.

The W. G. Nagel Electric Company, Toledo, O., is directing attention to its Hercules anchors which have been in successful use for some time. The manufacturer claims that the success of these anchors has been due to the recognized durability of the plate and their ability to withstand a considerable strain. The plate of the Hercules anchor is made of the best grade of malleable iron. The heavy center core is strengthened by braces and there is also a reinforced rib around the edge of the plate which affords additional strength. It is claimed that malleable iron rusts less than any of the irons and when buried that it will last an indefinite period. The plate of this anchor is, therefore, not liable to break under the most unusual strains, which is not the case with cast iron, even though the castings are particularly heavy.

The anchors are made in five sizes each adapted to its own particular class of work, but all embodying the same mechanical features and comparative strength. The maker claims that the anchors will hold anything from a 20-foot pole to a wrecking train and that they have been subjected to severe tests which have proved their capacity for withstanding the greatest strain that will ordinarily be put upon an anchor.


The Hercules Guy Anchor.

Indianapolis New Castle & Toledo Electric Railway.

Contracts have been awarded for the construction of the Indianapolis New Castle & Toledo Electric Railway, which will operate between Indianapolis and New Castle, Ind., with branch lines to Greenfield, Anderson, Muncie, Winchester and Richmond, a total distance of 140 miles. The road will not come into competition with any other railway and will be the only means of railway communication between Indianapolis and a large percentage of the population reached by its service. The company controls terminal facilities in Indianapolis which insure rapidity of entrance and exit to and from the city. In addition to the passenger traffic the company's franchise permits the transportation of freight and the road will be the means of bringing to Indianapolis a considerable portion of the farming products, coal and manufactured articles which originate on or adjacent to the lines of the new railway.

The road will be constructed on a private right of way 50 feet wide and the track will be laid with 70-pound T-rails and heavy ballast. The schedule so far prepared contemplates hourly runs between Indianapolis and Richmond and a frequent service over the branch lines. A limited high-speed service will also be established between Indianapolis and Richmond operating on a three-hour headway and making connections with trains on the branch lines. An express service will be provided for. Two 50-ton electric locomotives will be used for hauling freight and for switching.

The contract for the entire construction of buildings and roadbed has been awarded to the Electrical Installation Company of Chicago. The main power station will be located near New Castle and there will be 10 permanent and one portable substations with one substation installed in the main power-house building. Allis-Chalmers power and electrical equipment will be installed in the main power station and three substations which will be built at once. The building of the remaining substations will be delayed until later. The initial equipment for the power house will consist of two 1,000-kilowatt, turbo-generators to operate at 175 pounds steam pressure and 50 degrees F. superheat. The electrical ends of these units will be wound for 25-cycles, three-phase, 2,300 volts. The outside substations will each be provided with a 400-kilowatt, 25-cycle, three-phase rotary converter and three 150-kilowatt, oil-filled, self-cooled transformers. The boiler equipment will consist of three horizontal water-tube boilers of 400 boiler horsepower capacity fitted with mechanical stokers. Two boiler-feed pumps will be provided and also a feedwater heater of the open cast iron type. There will be two complete surface-condenser equipments and two exciter generators, one for each of the 1,000-kilowatt turbo-alternators. The switchboard equipment in the main power station will be designed especially to meet the requirements of the service and will be fitted with all the necessary protective apparatus and modern appliances.

Electric Railway Review

PUBLISHED MONTHLY BY THE WILSON COMPANY, CHICAGO

NEW YORK: 150 Nassau Street CHICAGO: 1660 Monadnock Block PITTSBURG: 510 Frick Building

Subscription Price, $1; Foreign, $3; Single Numbers, 10 cents Entered at the Post-Office, Chicago, Ill., as Second-class Matter

VOL. XVI SEPTEMBER, 1906 No. 9

Losses in Coaling Equipment.

Coal handling apparatus has become so important an adjunct of many large power plants that there is opportunity for no little waste in its operation if carelessness creeps in. The power plant attendant sometimes forgets that it takes perhaps half as much power if not more to run four or five hundred conveyor buckets empty as it does to operate the loaded system, and after the delivery of fuel to the bunkers and the collection of ashes has ceased for the time being, he is not always as prompt as is desirable in shutting down the 20 or 25-horsepower motor which propels the outfit. In some plants the bearings of the conveyor buckets are oiled weekly, and this is often accomplished by operating the endless chain empty, passing each bucket by two men with oil cans and a third man who serves as filler. As the task may take several hours in a very large plant, it is a matter of perhaps five or ten dollars a year per conveyor to pay for the power thus consumed. There would seem to be no reason why the oiling could not be affected while the conveyor is in regular service, at some point in its travel where the buckets are empty.

Wasting Steam and Current.

The lights which are installed at short intervals throughout a coal pocket and along the path of travel of a conveyor system are often allowed to burn needlessly, when the system is not in operation or under inspection or repairs. A count will show that there are more of these in service than one suspects, and it is a simple matter to install a switch with a red pilot lamp at a conspicuous point in the power house, which will insure less burning of the wasteful sort. A final source of loss is through condensation, radiation and steam-pipe leakage, in coaling plants which depend upon steam-driven hoists to raise the coal from the barge to the bunker or the main pocket. In a plant recently visited, 8 valves out of 15 four-inch stop valves in a live steam supply pipe from the boiler-room to the coal towers were found to be actively leaking steam, and yet the plant is one of the best installations of its kind in street railway service. The moral of this to the electrical engineer is: "Install motor-driven hoists with no stand-by losses, but if this is not considered feasible, be sure to install a stop valve in the main near the boiler room end, and keep steam off the coal pocket when the towers are not in service."

Legal Right Versus Good Policy.

The concession made by the Brooklyn Rapid Transit Company in extending the radius of the territory tributary at a five-cent fare to a great amusement resort, well illustrates the frequent difference between legal right and good policy in management. The temper of the public is constantly inducing concessions from transportation companies which could not be secured on the basis of strict legal privilege. A statement by President Winter of the Brooklyn Rapid Transit Company, published in our last issue, showed very clearly the reasonableness of the two-fare charge to Coney Island. Yet the fact remained that the residents of Brooklyn living south of Prospect Park and Greenwood Cemetery, that is, within three or four miles of the amusement resort, were compelled, because of the rigidness of the rules, to pay as much for their ride to the seashore as persons who board the car on Manhattan Island pay for their 10 or 12-mile ride; furthermore, the traffic was so great that only standing-room was available by the time the former unfortunates were reached. A "leaning to the side of mercy" seemed, therefore, imperative, and the five-cent zone very properly was extended beyond the limits established by legal interpretation. The transportation business, like other commerce between rational beings, is most satisfactorily conducted when all parties interested are too well satisfied to think of their legal rights.

The Baggage Question

Ever since the Ohio and Indiana electric lines began to negotiate with each other to determine what would be a satisfactory basis for interchangeable tickets and interline tickets, the charge to be made for baggage has been more or less a bone of contention. As the practice of the companies varied greatly the Central Electric Railway Association has been making efforts to find a basis on which all could agree. Investigations made recently show that to carry 150 pounds free and charge 20 per cent of the regular one-way fare for each 150 pounds (or fraction thereof) additional will produce approximately the same revenue as will a flat rate of 25 cents per trunk, the rate on many of the Ohio lines. The adoption of this rule would enable a road to extend the free baggage privilege and at the same time prevent its abuse by commercial travelers, while imposing no hardships on anyone. The excess baggage rate of the steam railroads in this territory is 12 per cent of the one-way fare for each 100 pounds in excess of 150 pounds; as this is on a three-cent basis it would be equivalent to 18 per cent on the two-cent basis which the interurban lines propose for their joint tariffs.

Timely Subject for Discussion

The development, improvement and consolidation of electric lines and the enactment of state laws permitting the carrying of freight are making interchange arrangements with steam roads desirable to a larger and larger proportion of the interurban roads. How can these agreements be reached? Can the distinct character of the two fields, as recognized by the officials of the steam lines which are developing electrical equipment for their local traffic, be made apparent? Can the steam railway officials be convinced that interchange is mutually advantageous; that, unless they enter the electric field themselves, extending and complicating their systems, they have need of the service of the interurbans in the assembling of local traffic at their terminals and junction points? Or will the inconvenience of passengers in buying two tickets and rechecking baggage, or of the shipper in getting one bill of lading from the electric road and another from the steam road provoke an appeal to the powers of the Interstate Commerce Commission to make through routes and joint rates on interstate business? Or as a last resort, will the electric roads appeal to the commission or to state laws such as those of New York? This subject is one of growing and vital importance to electric and steam lines and should have a full discussion by the officers of electric roads with a view to agreement upon some uniform plan of action to counterbalance the present almost uniform antagonism of the steam lines. The question of making prorating and interchange arrangements with steam roads and the methods for obtaining such arrangements might be brought up for general discussion at the coming convention of the American Street and Interurban Railway Association at Columbus in October under the report of the committee on "Promotion of Traffic," which is scheduled for Wednesday afternoon, October 17.

Detroit Franchise Controversy

The seemingly fair proposition recently made to the people of Detroit by the Detroit United Railway Company, which was at first welcomed as a settlement of the controversy which has agitated the city for years, is now meeting with considerable opposition, in which politics apparently is largely concerned. The company's offer, as embodied in an ordinance agreed upon by Mayor Codd and President Hutchins, and which is to be submitted to the people at the November election, is that in consideration of the extension of the present franchises from 1909 to 1914 it will agree to sell ten tickets for a quarter for use between 5 and 8 a. m. and 4:30 and 6:30 p. m., six for a quarter at other times, with a five-cent cash fare and universal transfers, pave the space between the tracks and pay to the city a tax of two per cent of the gross earnings. At the expiration of the franchise the city is to have the right to purchase the property. Several of the recently-built lines are now being operated on a three-cent basis and many are in favor of holding out for a similar offer for the new franchise. The city has also been innoculated with the municipal ownership germ and is opposed to a long franchise because it would delay the possible purchase of the lines. Straw ballots taken by several newspapers show a strong feeling in favor of three-cent fares and municipal ownership. Among the various arguments against the ordinance are that operating expenses may be so reduced in the next few years that the company will make too much money, and that the new plan discriminates against the people now living in three-cent territory. The situation is complicated by the appearance on the scene of a new company, the People's Railway Company, which has asked for a franchise on a three-cent basis to be terminable at any time by purchase of the property by the city. From present appearances we are likely to witness a repetition of the Cleveland controversy in Detroit before any settlement is reached.

Proper Care of Foreign Equipment

The increasing number of foreign cars now being routed through the systems of companies which do not own them introduces a question of no little importance in the routine work of the local repair shops. There is sometimes an uncertainty as to what extent it is desirable to execute repairs on foreign rolling stock, and a definite agreement upon this point is one essential of continued harmonious operations between the various roads whose tracks complete any given through route. On steam railroads the repair shop facilities are usually so highly developed—even when the shops themselves are out-of-date in equipment for economical production—that freight car repairs can be handled without difficulty, regardless of who owns the defective rolling stock. The movement of passenger cars and locomotives is much more restricted, with the exception of Pullmans, but even here associated lines are introducing certain standards of construction which enable the rolling stock to be expeditiously repaired in case it breaks down or is injured on other than its own tracks. The Harriman system in the far west, for example, has recently taken up this matter with particular reference to locomotives. The work of the Master Car Builders' Association in establishing freight car coupler, journal and wheel standards has been most useful in promoting convenience of repair in local shops. On electric railways, however, the rolling stock is not as yet subject to any such frequency of interchange, and many shops are not fitted to handle the repairs of cars and electrical equipment which often differ so widely in point of size and character from the features prominent in the local rolling stock. Many shops on small roads are supplied with little more than car house inspection pits and work benches, and with such limited facilities it is out of the question to perform heavy work upon the powerful rolling stock units used for the through schedules.

Repairing Foreign Cars

It is certainly desirable to establish in all local shops facilities for light repairs on all cars which traverse the local systems. There is no reason why such shops cannot turn out at least temporary repairs in a good many cases which will be sufficient to enable a disabled foreign car to make its own way home without falling behind the regular schedule. The replacement of controller parts, renewal of trolley wheels, renewal of lamps and fuses, brakeshoes, register cords, air-brake hose when trains are operated, primary batteries, and in some cases, armatures and field coils can be effected without heavy expense for labor, long delay in the shop or large investment in special appliances. In large shops there ought to be facilities for rebabbiting bearings on foreign cars, as well as on local rolling stock. Again, the turning down of commutators and the renewal of motor brushes are simple jobs for any shop. The larger the shop, the more extended is the field of possible repairs. In the majority of local shops, however, only such repairs are desirable at present as will permit the car to return in regular time to its own hospital. Such work as painting, special jobs in carpentry, pressing wheels on or off axles, wheel turning and grinding, complete rewiring, etc., should preferably be done in the shops of the company which owns the defective rolling stock. No hard and fast line can be drawn as to what is desirable in all cases in the way of repair limits; local facilities vary, and the accessibility of the home shops is a factor to be considered. The vital point is to maintain continuous service, debiting the owner of the car with the net cost of temporary repairs.

The Auto as a Feeder.

From time to time there appear announcements that such and such an interurban railway will supplement its local and through service by auto auxiliaries. The ratio between the number of such announcements and the gasoline busses in actual operation we should judge to be large. For such service a car is needed which can equal the reliability of the interurban cars with which it connects and maintain its schedules over public highways under road conditions varying from good to bad. The situation is different in a city where there is solid pavement upon which such a bus may run, and gasoline motor cars for interurban service on substantial tracks have even a greater advantage over busses which must operate on public roads. There have been experiments made in various parts of the country with a view to introducing auto-busses as feeders to interurban lines. We do not know that the results can more definitely be described than by the words of an interurban manager in the Central States, who has made his own experiments with the auto omnibus and says: "The things are too unreliable; as a pleasure vehicle the auto fills the place, perhaps because a pleasure trip is not laid out to follow a publicly advertised schedule, and when your automobile lays down on a pleasure trip you may be laughed at by a few people, but you are not cursed by the general public. The main difference appears to be that in one case you do the cussing yourself and in the other you are the object. No schedule depending upon the erratic movements of the gasoline engine and leaky tires can ever establish itself as reliable."

Municipal Operation Abroad

Mayor McClellan, of New York, who has been traveling in Europe during the summer, has given out the following interview expressing his opinion on the municipal ownership of street railways abroad: "I have kept my eyes wide open for evidence of successful municipal operation, particularly in Germany, which is constantly held as an example, but I have failed to find it. I have discovered conditions in cities like Frankfort and Dresden, which own their street railroads, which no American community of second rate importance, to say nothing of New York or Chicago, would tolerate. Not only is the traffic of these places insignificant, judged by American standards, but it is handled inadequately and inefficiently. The conditions in Great Britain, with the possible exception of Glasgow, where our cousin, Mayor Dunne of Chicago, has been taking lessons, are even worse than on the continent. The British tramways act of 1873 gives municipalities options upon franchises before the franchises exist, and the result has been the perpetuation of old-fogyism, and the stunting of private enterprise. My European observations convince me more than ever that municipal operation is the last desperate means which ought to be resorted to only when private enterprise has absolutely failed."

Public Ownership and Labor

The effect of municipal ownership on wage-earners was discussed before the American Society for the Advancement of Science recently by Mr. H. T. Newcomb, of Washington. While the advocates of municipal ownership solicit the support of wage-earners on the ground that public ownership means higher wages, shorter hours and better conditions, Mr. Newcomb presents the proposition that the government is not only not the best employer of labor, but is not even a fair employer, and that when the government engages in business on a large scale the condition of the employe degenerates to that of slavery. Statistics of the Bureau of Labor are cited showing that between 1896 and 1904 the average retail cost of food has advanced 16.96 per cent in the United States; that in private employment the average wages per hour have in this period increased 17.36 per cent, and average weekly earnings have increased 12.76 per cent; but that there has been no corresponding increase in the pay of federal employes—letter carriers are paid the same wages as in 1887. Conditions in New Zealand and in several European countries are cited to show that public ownership involves compulsory labor—a condition that is incompatible with the personal liberty of the laborer.

Joint Interurban Tariffs

The rapidity of the development of interurban electric railways in the Middle West is emphasized by the determination to formulate joint tariffs of through rates for the lines in Ohio, Indiana and Michigan. This work is being done by Mr. J. H. Merrill, secretary of the Central Electric Railway Association, under the direction of a committee composed of the traffic representatives of the companies which are members of the association. In the three states there are now in operation over 3,000 miles of interurban lines, 580 in Indiana, 1,950 in Ohio and 550 in Michigan (these figures do not include the city lines operated by companies doing an interurban business), which in some instances offer four or five routes between the same points. The scheme in hand contemplates two tariffs: The first, which will be the Indianapolis tariff, will cover all routes in Indiana, and those to Toledo, to Zanesville and to Cincinnati from Indianapolis, including the various branch lines in the Ohio territory lying between these points. The second, which will be the Toledo tariff, will cover all the Ohio lines and those in Michigan which can be reached from Toledo. Michigan-Indiana rates and Indiana-Northern Ohio rates will be determined by combining the two tariffs. The basis of the joint tariff will be the short line rate (which in many instances will be that for a route partly by steam railroad), the sum of the local rates on electric lines being reduced to meet the short line rate and the reduced total prorated to the interurban lines on a mileage basis. The rate for through tickets will be approximately two cents per mile.

RAILWAY MOTOR RATINGS.

The selection of motors for commercial operation under the varying conditions of electric railway service is one of the most difficult problems in the motive power field. On account of the large number of variable factors in the problem of determining motor ratings, scarcely any other topic in electric railway practice has been so productive of differences of opinion. Within the last year or two, however, the atmosphere has cleared somewhat, and it is not too much to say that at the present time railway motors can be selected with reasonable accuracy of prediction as to their performance, provided the service conditions are definitely stated in advance and adhered to in actual operation.

Large sums of money have been spent and much careful experimental work has been carried on by the great manufacturing companies with a view towards determining the service capacity of each new type of motor as it has appeared fresh from the drafting board and shop. The data collected by experimental runs on test tracks at the builders' works have been of the highest value in guiding the designer toward perfected types of railway motors, and when any important proposition is in hand, it is certainly a mistake for an operating company to fail to avail itself as fully as possible of this experience. But when all is said and done, the fact remains that in the actual service of carrying passengers on city or suburban streets and interurban right of way, uniform conditions seldom prevail. There is every justification, therefore, for searching service tests, no matter how thoroughly the temperature rise of the motors may have been determined by advance calculations based on estimates of the car weight, equipment and load weights, gear ratio desirable, line voltage, train resistance, alignment and grade of track, schedule and maximum speeds, desired lay-overs, probably delays and average number of stops per mile.

It is almost a certainty that in urban and suburban service many of these factors will vary from time to time from the original estimate. In elevated and subway service, the stops are rigorously defined; the train resistance as a function of speed and track conditions ought to be pretty well settled, but even here the block signal system and growth of traffic may impose unforeseen slow-downs and subsequent accelerations which add to the heat increment of the motor performance in a manner scarcely anticipated. For interurban service on a private right of way with a minimum interval of 15 minutes on single and 5 minutes on double-tracked lines, with fixed stopping points, it should be the least difficult to predict motor performance for a given schedule. But in every class of service the actual commercial test is essential to permanent economy of motive power operation.

Such tests need not be elaborate, fortunately, to determine the economy and capacity of the motors for service on a given route or division. It is by no means an expensive matter to make a large number of records of the temperatures which the motors attain in service, both by the thermometer and the resistance methods. Again, the number and duration of stops on a given route, the number per mile, the gear ratio which gives the best temperature results for a given schedule, the car weight complete and the average voltage, current, and watt-hours per ton-mile, as far as these data may be desirable, are not difficult to obtain; but the temperatures and commutation of the motors are the vital points in the determination of service capacity. The more extended analysis gives a line upon the possibility of saving power by installing a different gear ratio, relocating certain stops, increasing the capacity of the feeder system to better the voltage conditions, or possibly by changing to another size of motor, if the contract has not been closed for a large number of a definite rating and size. There is work enough on most systems in the analysis of equipment economy and schedule adaptation to keep an electrical engineer busy a large part of the time.

In far too many cases it is the practice to make an offhand guess as to the fitness of a given motor to perform the service intended, or else send the manufacturers imperfect or incomplete data, and then operate the machine in service without much regard to its efficiency or heating, as long as it will propel the traffic over the line without breakdown at too frequent intervals. And in this connection it is well to remember that the repair shop records of car equipments are worth studying, from the time the motors are first overhauled until the day when they are sold or scrapped. The broadest knowledge of the fitness of a line of motors for a given service cannot be had without a definite idea, drawn from shop experience, of the cost of maintenance.

The fact that service tests are desirable on all schedules which involve new elements in comparison with previously established practice does not in any way affect the wisdom of determining the limiting conditions and capabilities of a motor before actual trials with passengers on board the car or with an artificial load can be made. The extent to which the preliminary analysis should be carried depends upon the importance of the service, including immediate future applications of a given type of motor. In any case the manufacturers ought to be given the principal data as to car weight exclusive of electrical equipment, trucks, curves, grades, schedule, length of route, principal dimensions of cars, seating capacity, speeds desired, line voltage if known, and the maximum and minimum number of stops per mile. Even though certain of these items may vary widely when the motors are put upon the streets, the limits of the problem can be pretty well defined for assumed sets of conditions.

It is doubtful if it is worth while for an intending purchaser of railway motors to attempt exhaustive preliminary calculations of heating and capacity. These are a task for the manufacturing specialist who has access to hundreds of tests and the data derived from them; but rough preliminary estimates by the purchaser are certainly desirable. Progressive makers of railway motors supply characteristics of performance in bulletins, and from the tables and curves furnished one can often obtain a fair idea of what the motors can be counted on to do, under a definite set of conditions. These conditions may never be realized exactly in practice, but they may be assumed as a basis for future discussion, and in many cases where nothing specially unusual in the requirements occurs will give a close approximation of the suitability of a motor for the service. The averages may affect one another enough to render a decision safe that a certain motor can or cannot be used. In some cases operating companies plot speed-time and speed-distance curves based on the published characteristics, and these are most helpful in determining schedule possibilities. The heating problem is another story, and as a rule an operating company has not sufficient specialized knowledge of the motor design to determine the temperature rise, although there are, of course, exceptions. These figures inevitably rest upon assumed conditions—the selection of train resistance alone under different conditions is a task that seldom can be satisfactorily undertaken by anyone except an expert in that particular line—and even experts are not entirely at one upon this subject, although the Zossen tests, and experiments made in this country have removed the probable range of resistance figures under normal conditions. To sum up the whole matter, approximate determination of motor capacity can now be made by the purchaser and extremely accurate predictions of performance can be set forth by the manufacturing engineer for a given assumed set of conditions; both of these activities are desirable and essential in all new work, but the final answer to the question of all-around fitness for the service is best secured by the test under actual operating conditions on the purchaser's own lines.

INCREASING THE PROFITS OF INTERURBAN RAILWAYS.

Profits may be increased upon an interurban railway in but two ways—by increasing the traffic or by reducing the cost of operation. Both of these methods are constantly being attempted by progressive roads, but there is little doubt that increase of traffic offers greater opportunities for success than do lessened expenses, under present conditions. Very few electric interurban lines are operated at more than 20 or 25 per cent of their full capacity, figuring on the maximum number of single cars which can be safely forced over the route in a given time. A double-tracked line with cars operating at a maximum speed of 50 miles per hour ought to be able to pass individual train units on each track at five-minute intervals in perfect safety with suitable operating rules, but the traffic seldom warrants anything less than a 15-minute interval on through interurban routes. The extended use of the multiple-unit system of control in interurban equipments is a potential advantage that has as yet not been widely utilized in doubling or trebling train capacity. The great majority of interurban trains are composed of single cars, and the full resources of a road equipped with train control will not be drawn upon until the single car gives way to the multiple-unit train running upon the shortest headway possible with the single car itself.

The cost of operation of an interurban line is so much lower per mile of track than the cost of running a great city system that an increase of traffic on the former is relatively more profitable, and there is every incentive to develop new business on a line which possesses the percentage of reserve carrying capacity which characterizes most interurban systems. The gross earnings per mile of track on a city road may be four or five times those of the interurban, but in such event the operating cost is likely to be six or eight times as great on the urban lines. Maintenance of way, taxes, and wages per mile of track or per car mile are vastly greater on the city system, notwithstanding the larger car mileage and extent of the urban road. Any increase in profitable car mileage on an interurban road is therefore bound to be a powerful factor in augmenting the profits. Interurban fixed charges remain about the same for an enormous increase of traffic, and the extra cost of carrying an additional carload of passengers is small in proportion to the increase of profits.

These are some of the seasons why it is getting to be more profitable to make special efforts to increase interurban earnings than to reduce interurban expenses of operation. Of course, one would not for a moment counsel neglect of expenses, but it is a question if these are not down pretty close to bed rock on many systems. A possible source of waste on an interurban line is dead mileage. In case extra cars are to be run over part of the system from a car house to some objective point where a large return traffic is anticipated, it is usually a better plan to allow these extras to carry passengers on the outward as well as the inward trip, than to shut them up and refuse fares in the direction of their destination. The steam railroads are giving a great deal of thought to dead mileage, and while the conditions on electric railways are in no sense as burdensome in this respect, it is well to remember that every idle movement of a car consumes power and costs heavily in wages in proportion to the distance covered.

At the power house end of the line equipment is undergoing radical improvements, and the steam turbine and gas engine have both opened up a field of promise in respect to power economy on small roads. Perhaps the most notable advantage of the turbine for a small road with a poor load factor is its light load economy, while the gas engine plant offers low fuel consumption even in small sized installations. There is also room for improvement in transmission and distribution losses, including the perennial rail bond question. On small roads, the distribution of car labor is frequently faulty, and in efforts to approach an operating ratio of 50 per cent, the arrangement of conductors' and motormen's time is well worth studying. Repair shop methods on small roads—and any interurban line is essentially a small road in comparison with a large city system—are often full of expensive makeshifts. It is also sometimes forgotten that high schedule speed means fewer cars in service for a given interval.

Established interurban railways cannot create traffic where none exists, and there is a reasonable limit to advertising. But this is a growing country, filled with almost unparalleled national resources and opportunities. The interurban line of today is no longer a disjointed link between two adjacent city systems—it is an actual railroad without regard to the motive power used, and is certain to become more and more influential in the community served as time goes on. There is much to learn from steam railroad experience, and the tendency of the steam and the electric line to supplement each other is so marked that the new business-getting methods of the older systems are in many cases applicable to the newer.

PATERNALISM IN ACCOUNTING.

There have been decisions in a number of states holding that street railway companies are "common carriers of passengers for hire," and even if state laws distinguished between "railroads," and "traction companies" there is but litle doubt that the courts will hold interurban railways also to be common carriers, especially if they chance to be engaged in interstate business. There are a number of railways, both urban and interurban, which at this time are operating a cross-state line. In some instances separate organizations have been maintained, a company in each state, and so far as passengers are concerned the operating company might maintain technically the position that the traffic is not properly interstate. This, however, could hardly be done as regards freight or express matter.

It is probable that in a comparatively short time the Interstate Commerce Commission will be found attempting to exercise a jurisdiction over electric railways which will become of greater importance as these roads develop their freight and express business. Therefore, it behooves electric railway interests to exert their influence to secure elimination of the unsatisfactory features of the Hepburn law. One of these is that giving the Interstate Commerce Commission power to prescribe the accounts which railroad companies shall keep. Although at present the point is of minor importance, it is too much to hope that this condition will obtain indefinitely.

Everyone knows that the only purpose which congress had in view in providing for a uniform method of railway accounting was to supply a means for detecting and preventing rebates from the published tariff. It was proposed to open all books of accounts to authorized agents of the Interstate Commerce Commission, the body appointed to enforce the law against rebates, and to simplify the task of inspection uniform accounts seemed advisable. It was realized that the ordinary government employe might easily be helplessly confused in dealing with different and necessarily complicated systems of bookkeeping and in his interest the plan of an officially prescribed system was determined upon.

Other consequences of the plan were scarcely considered even if anyone actually took the trouble to look beyond the purpose directly in view. The consequence is that the legislation adopted goes far beyond the actual need for which it was ostensibly adopted and threatens to bring about evils whose far-reaching character might easily have been recognized by congress.

It is merely repeating the obvious to declare that the purpose of railway accounts is to bring into existence and perpetuate a knowledge of the detailed results of the railway business that will disclose its condition at any time and constitute a record of its progress. The larger the scale on which any industry is conducted the greater must be the dependence upon information of this sort. The newsboy on the corner knows by the weight of his bundle of papers whether his day's enterprise has been fairly prosperous. If he advances to the proprietorship of a news stand the same knowledge can be acquired by an hour's inspection of his stock and one hasty glance at the figures in the single-entry cash book which is his sole book of accounts. Let the same individual become a book and periodical publisher and he is then forced to rely, for knowledge of the state and progress of his business, upon tabulated data—the tabulations growing more and more complicated as the business expands. And if the successful publisher should purchase a rival establishment he would find that its necessities had led to the development of an accounting system resting upon the same great principles and similar in some of the fundamental features but differing widely in its details. In fact, it is simply impossible that two successful establishments in the same line of business should find themselves adequately served by precisely the same system of accounts. To attain the maximum of utility a system of accounts must be a consequence of the particular conditions of the enterprise to which it relates. This is equivalent to saying that it must grow with the business and be developed by those whose intimate knowledge of its details and acute perception of its needs are the result of extended daily contact with both.

The application of these principles to railway accountancy is sufficiently evident. No business in the world is conducted by such extensive operative units, in none is the actual dependence upon accurate and adequate accounting so complete. Destroy or materially impair the data which the skilled accountant supplies to those whose duty it is to control and direct railway administration and demoralization, amounting almost to chaos, is sure to be the early result. Yet the new law puts in complete charge of this primarily important branch of railway activities a government bureau whose officers and chief agents have had no practical experience in the railway business. Worse than this, their sole or at least their principal aim is likely to be the merely negative one of eradicating a serious abuse rather than the positive and constructive purpose of developing and perfecting railway methods.

The most startling problem is presented by the inquiry as to the effect the law will have upon individual initiative in the accounting and operating departments—for both are controlled. Many highly useful economies in operation have a history something like this: Someone is casually struck by a suspicion that some particular method or process is not the best that could be practiced. It is only a suspicion and the man who harbors it may be a subordinate without power to modify or correct the practice in any event. He hesitates even to criticise a method evolved by his official superiors until he can collect evidence to prove his point. The ambitious railway employe, under such circumstances, goes to work to watch the results of the method he suspects of being wasteful. He institutes private records that disclose its results or throw light upon them and he devotes his evenings and the spare time—not belonging to the railway, his employer—to keeping and studying them. At last, when fully equipped, he goes to his superior officer, presents his case and obtains a decision. Often the decision itself is merely to carry further the statistical investigation.

Now, there is nothing very criminal in the foregoing. On the contrary the result may be vastly to lessen the cost of doing railway business and consequently greatly to benefit the public. Yet the new law, on its face, appears to prohibit and penalize just this sort of thing. Not even memoranda can be kept without the authorization and approval of the Interstate Commerce Commission. If the individual initiative of Americans can be destroyed by legislation, this would seem to destroy it.

The situation may, however, be saved by the continence of the commission or by the unconstitutionality of the accounting provisions of the law. Upon the latter great reliance may be placed. It seems inconceivable that congress can lawfully prevent the owners of property or those charged with its administration from keeping those records, accounts and memoranda which they, in good faith, regard as aids to successful management. If this can be done, it is unthinkable that, with a full realization of the consequences, congress would attempt to do so. The repeal of the accounting provision of the new interstate commerce law or their very material modification (and mitigation) ought to be one of the earliest acts of the next session of congress.

What has been said is not to be construed as an argument against uniform methods of accounting. On the contrary, nothing is better calculated to advance the interests of railways than the adoption of standard forms for keeping accounts which will permit of comparisons being made between different systems. In this respect uniformity is of importance to the public because investors and others interested can get more intelligent ideas concerning the relative merits of different properties, and it is also of even greater importance to the companies themselves because it permits of comparisons being made by the management with a view to rectifying the mistakes which any one company may be making and reforming wrong practices.

For ten years the efforts of the American Street and Interurban Railway Accountants' Association have been directed towards formulating acceptable standards for certain portions of electric railway accounts and reports, and the standards recommended by this association have been widely adopted by the railways. These standards form only the basis of each road's accounts, however. The conditions under which a road is operated vary greatly, and we venture that scarcely one of the companies using the Accountants' standards does not find it necessary to amplify them by subdividing accounts, interpolating additional forms in various departments, etc. Such minor variations and subdivisions do not interfere in the least with the general purpose which is sought by adopting standards because the variations, while essential to the best results in the management of the individual property, are not necessary for purposes of comparison and they do not interfere with a recombination of the divided items when a comparative report is being drawn.

On this matter Mr. W. B. Brockway, president of the Accountants' Association and for eight years its secretary, goes so far as to say: "There are many reasons why the hope is expressed that a standard method of accounting from first to last may never be adopted. The principal reason is that it must surely destroy the individuality in the human part of the work, and if that time comes the electric railway accounting service will suffer as much as the steam railway accounting service has in being tied to the ideas and wishes of others."

MUNICIPAL OWNERSHIP AT WORK.

Although vigorously advocating public ownership on every possible occasion Mayor Tom L. Johnson, of Cleveland, and the subordinate officers of his administration seem determined to illustrate all the evils of political management by the manner in which they handle the public business of that city.

About the only service formerly performed by contract with a private concern which Mr. Johnson has succeeded in municipalizing, since he became mayor in April, 1901, is the collection of garbage. The character of this service, as it is rendered by the Board of Public Service, is now bitterly attacked by those for whom it is, or ought to be, performed. The Cleveland News of August 21, 1906, says:—

> In some parts of the city, especially the foreign settlements, it is charged, garbage is never removed by the city collectors, but is allowed to accumulate in cans, boxes or barrels, until the residents see fit to dump it into the nearest ravine or rubbish dump, where it decays and pollutes the air. Even in excellent residence districts, according to evidence obtained in a canvass by the News, Monday, garbage cans are not emptied for a week or more at a time.

The secretary of the board of public service, according to the same authority, admits that the city employs more men than were employed by the private concern that formerly did the work and that if these men did their duty the service ought to be better than it was. He excuses the infrequent collections on the ground that in order to make them oftener during the heated term it would be necessary "to change all the routes." Evidently he holds that city employes ought not to be expected to undertake to change routes twice a year merely for the sake of adequate sanitation.

When he first took office Mayor Johnson placed a socialistic clergyman in charge of the charitable relief work of the city. One of the city councilmen now charges that this department has bought land improvidently for the "Warrensville farm colony," has purchased much more than was necessary and has allowed extravagant prices and excessive profits to the intermediaries employed. A total of 1,615 acres has been bought for $256,407.60, or at an average cost of $158.72 per acre. Of this total 1,301 acres were bought from two men for $204,934.40, and, while complete information is lacking, it is known that in one sale they handed over to the city for $116,450.00 a tract of 832 acres that was part of a tract of 844 acres, which they had purchased on the same day, from various individuals for $92,423.42, a profit of $24,026.58.

Prof. Edward W. Bemis, once of the University of Chicago and teacher of political economy in the University of Kansas while that institution was temporarily in the control of the Populist party, was a well-known advocate of public ownership long before Mayor Johnson's adoption of that political rostrum. Although at the time a resident of Springfield, Mass., one of Mr. Johnson's first acts as mayor was to bring Prof. Bemis to Cleveland and place him in charge of the city waterworks. Since that date Prof. Bemis has given a good deal of time to the advocacy of municipalization of street railways, lighting plants, telephones and other public utilities, in Cleveland and elsewhere, and has devoted some attention to the supervision of the municipal water service. The chairman of a committee of the city council which has just reported upon the results of a long investigation of the water works voices a prevailing opinion of Cleveland's citizens, as follows:—

> The whole thing points to one fact, and that is that Mr. Bemis is not in his office enough to know what is going on.

This investigation was ordered by a vote of the council on October 16, 1905, but the committee has just rendered its report. The character of the opposition to a practical inquiry which caused this delay is suggested by the fact that the expert accountant first employed by the committee was allowed to retire from the investigation after he had displeased

Mayor Johnson by a partial report in which the methods of the water department were sharply criticised. The Cleveland News says that:—

> Mayor Johnson intimated that if an expert to whom he had no objection be employed he would pay the bill out of his contingent fund.

It is not surprising to learn that the report of the mayor's expert was "as favorable to the waterworks officials as Hohlfelder (the first expert) had been unfavorable."

Nevertheless, the report just submitted constitutes a severe arraignment of the unbusiness-like methods of the water department and, while no charges of corruption are made, it points to many lapses in the system of accounting that would easily cover frauds upon the city. The conclusions of the committee are stated, as follows:—

> First. That at and prior to the time of the appointment of this committee the records of the water department were loosely and inaccurately kept, and that they were incomplete in important particulars, and, further, that those in charge of the said department had fostered a system whereby meter bills were cancelled and destroyed in violation of the rules governing the department.
>
> Second. That the executive head of the water department was guilty of abuse of discretion and unwarranted assumption of authority in the management of the water department.

The report declares that no income account, showing receipts and expenditures of the department, is kept and that in order to obtain the financial results of a year or any other period it would be necessary "to make a detailed examination of each group of books contained in the separate divisions of the department." Therefore, the committee states that it has found itself "unable to make any finding with respect to the general financial condition of the department."

The committee also found that there had been no complete check of the water connections in use and those not in use since December, 1903. It appears also that bills rendered to customers of the department were reduced or cancelled "in a large number of cases" without any reasons being placed on record and that it is now impossible to ascertain whether favoritism was or was not shown in making these changes. Where reasons were recorded, the report states that "in many cases" they "were purely arbitrary or accidental in their character."

Bills were cancelled for reasons not permitted by the rules established by the city council "in a great majority of cases," and, says the committee:—

> Instead of cancelling the bills by transmitting to the city treasurer and city auditor, the superintendent of the water department has rendered inoperative the rules requiring such transmission by cancelling the old bills and ordering as a substitute a new one set up for a different amount.

Quite moderately, we think, the committee calls attention to the "opportunity for fraud and favoritism" which such practices permit. When the report was submitted, Prof. Bemis, having recently returned from a prolonged trip in Europe, was, according to the Cleveland Plain Dealer, in "New York, where he is engaged in aiding the municipality in its effort to get 80-cent gas."

In still another way has Mayor Johnson, this time in his own person, illustrated the beauties of political ownership. Recently he determined to take personal control of the democratic organization of Cuyahoga county, the county in which Cleveland is located. The way in which he accomplished his desire is indicated by the statement of the Cleveland Press, his most ardent newspaper supporter, that "city employes dominate the delegate lists" for the county convention. Actually, to a democratic convention containing precisely 300 delegates, Mayor Johnson succeeded in sending no less than 151 employes of the city of Cleveland. In addition the city delegation (there were 62 delegates from the county, outside of Cleveland), of 238 members, included 24 saloon-keepers and 63 "unclassified," many of the latter being contractors engaged on city work. The inference that the saloon-keepers selected were quite as subservient to the mayor as his appointees in the city hall is as natural as the suggestion that if Cleveland owned its street railways and a few other "public utilities" it would not have been necessary to send any delegates who were not on the city pay-roll.

Just how nicely municipal ownership, the spoils system, and political bossism work together is also shown by a resolution adopted at one of Mayor Johnson's conventions. This resolution follows:—

> Resolved: That the executive committee of the democratic central committee in and for the City of Cleveland, be authorized to levy an assessment upon the nominees of this convention for the different offices to be nominated therein and he also empowered to remove from the democratic ticket the names of all such nominees who fail to pay such assessment before 3 o'clock, p. m., standard time, March 18, and that the executive committee be given full power to fill all vacancies.

If anyone believes it would be possible to maintain popular government against such a system as this he has some excuse for favoring municipal and general public ownership.

BRAKESHOE STANDARDS.

The American Street and Interurban Railway Association and the Engineering association have appointed committees to investigate the general problem of standardization and to undertake such work of this nature as seems advisable at this time. The active work is being done by the committee of the Engineering association, of which Mr. H. Wallerstedt is chairman. This committee is now considering brakeshoes, journals, journal boxes, wheel treads and flanges, and rails for street and interurban railways. The standardization of electric railway equipment has been recognized for several years as a matter deserving attention. In 1901, and again in 1902, committees appointed by the American Street Railway Association recommended various standards which included axles, journal boxes, brake heads and brakeshoes practically identical with those adopted by the Master Car Builders' Association. The matter of standards for those parts of the equipment most frequently renewed has also been taken up by the New York State and the Central Interurban associations.

The reasons for having standards have grown in importance in recent years. Interchange of equipment, which a short time ago was practically unknown, will, in a short time, probably be the rule rather than the exception. Single roads are becoming larger, and with the larger equipment necessary, the carrying in store of repair parts of different patterns is a serious burden, to say nothing of the delays which are experienced when new supplies are ordered, because of the multiplicity of designs with which the manufacturer is burdened.

In the matter of brakeshoes there is room for improvement which will be conducive to greater economy. Electric railway trucks are subject to a number of limitations not found in steam railroad practice, notably the shorter wheel base desirable for operation over sharp curves and to keep within the dimensions imposed for cars which operate through towns and cities; also the fact that much space is occupied by the motors, especially with four-motor equipments. Consequently the builder often finds it difficult to design the brake equipment to conform to M. C. B. standards, and as a result there have been dozens, possibly hundreds, of designs of brakeshoes. In some instances the head is made a part of the shoe, and when worn out the scrap weight of the shoe is as much as 70 per cent of what it was when new. This means that the user is paying about twice as much as he should for the metal actually worn in stopping the car. This difference in net price per pound is not all, because the manufacturer must charge a higher price for special designs and they must be ordered in larger quantities than would be necessary in case the shoe conforms to the standard.

With a high cost for brakeshoes there is a temptation to economize brakeshoes at the expense of wheels, which is a costly proceeding. The brakeshoe manufacturers appreciate the conditions fully as well as, if not better than, the railroads, and are anxious to co-operate with the association in adopting a satisfactory standard that will reduce the number of patterns and the quantities of manufactured goods that they must carry in stock and thus permit them to facilitate deliveries. One of the leading brakeshoe manufacturers has pointed out that on any road where the wheels are of approximately the same diameter (within 2 or 3 inches) and have treads of the same width, a brakeshoe of one pattern may be used on all the equipment regardless of how diverse in original design the brakeshoes may have been. The changes necessary to secure this are few and simple. For each class of trucks which now require special shoes it may be necessary to provide a special brake head into which the standard shoe will fit, the dimensions of the new shoe and head being kept within the limits of the old one-piece shoe. The only change in practice would be that on many trucks when renewing shoes the head would have to be removed from the brakebeam before the worn shoe is taken out of the head, because of there not being room to withdraw the key or the shoe (or either of them in some cases) when in place on the truck. The need of removing the brake head from the beam involves no difficulty, being in most instances nearly as easy to do as to remove the shoe alone.

Experience has shown that the Christie pattern is most satisfactory in steam railroad service. and as this standard of the Master Car Builders' Association has already been twice recommended by the electric railway association, the present standardization committees may be expected to report favorably upon it.

CAR MILEAGE ECONOMY.

The importance of economical power production on electric railways is so widely appreciated at the present time that there is danger on some systems of losing sight of a much greater source of possible loss—the car mileage record in relation to the hours in which a piece of rolling stock is in actual service outside the car barn. There is no intention in these comments to belittle the praiseworthy efforts which are being made in so many quarters to reduce the cost of generating and distributing power; there is certainly need enough for such work on many systems, and as long as the progress of applied science continues in the oil, gas, alcohol, steam turbine and reciprocating engine fields, as long as machines continue to replace hand labor in the movement of fuel, control of output and transportation of ashes, so long will the subject of power house economy be of live and immediate interest.

There is one great difference, however, between the central station man and the street railway manager. The former sells electricity, and exhaust steam perhaps, for lighting, heating and power purposes. Every kilowatt-hour delivered to the consumer represents a long chain of supervised and inspected events in the generating plant and on the distributing circuits. At the power station the output must be accurately measured, but at the consumer's end of the line we find in the meter the critical point of the whole business. What the consumers pay depends upon the accuracy of these many separate instruments, and central stations rightly go to great expense to keep the equipment in good order. Every kilowatt-hour lost in the central station line is just so much dead waste to the operating company, just so much decreased earning power and decreased capacity of the line through the obstruction existing.

The street railway man sells transportation, not kilowatt-hours, and the power question is after all of subsidiary importance in comparison with the transportation expenses. Suppose it costs one cent per kilowatt-hour to deliver energy at the car motors, and the car requires 2,500 watt-hours per car-mile. What sensible manager would refuse to carry a dozen more passengers on this car because in so doing the energy consumption jumps to 2,600 or 2,700 watt-hours? Certainly the increased earnings are far above any increased power cost with modern equipment.

In a large system the cost of wages per car-mile may easily amount to 40 or 45 per cent of the operating expenses, as against only 10 or 15 per cent for power. Since in the majority of cases wages are based upon hours of service on the platforms and time spent on call at the car house, it is exceedingly desirable to get as many car-miles out of the rolling stock in a day as is consistent with the traffic requirements and the speed regulations in force in the community served. It is not only a question of operating well-filled cars on schedules laid out in response to the actual or anticipated, real or artificial demand of the public for accommodations; it is also a matter of operating the cars that do run as nearly on time as is possible, and as rapidly as is feasible.

High maximum speed is not so much the point in city service as is high schedule speed. It may seem trite to point out again the importance of short stops, quick acceleration and rapid braking—the handbrake has no legitimate place in a perfected urban transportation system except as an emergency service—but upon these factors more depends than is generally appreciated. The higher the schedule speed, the fewer will be the cars required to perform the schedule, and the lower will be the wage cost per car-mile. Anyone can figure out for himself the saving which would result if each one of his cars should save 30 seconds on each round trip. In some cases the saving would be small, but on certain large systems the multiplication of a few paltry seconds per car by hundreds means something. It is not an easy matter to appreciate the financial bearing which the creation of a lot of additional pole stops on a route has, but it is absolutely certain that delays of all kinds are very expensive in proportion to the time they consume on a large urban street railway system.

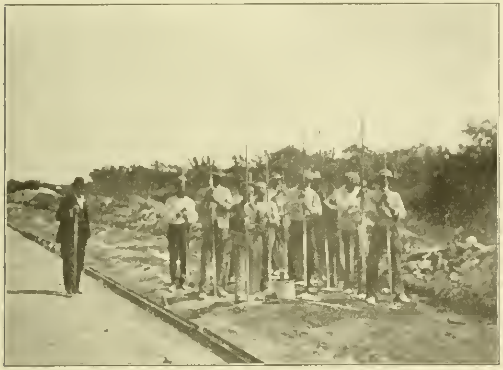
It is certainly as important—more so, many experts believe—to cut down the delays on any route as it is to reduce the cost of power per car-mile. The electric track switch is a step in the former direction; the operation of elevated train doors by compressed air another. It is impossible to avoid the slow-downs and stoppages which the vehicular and pedestrian traffic of a great city's streets impose upon the moving trolley car, but it is possible to spread out suburban stops in comparison with the stops in the congested district; to discipline car crews to make quick transfers in changing tricks and going on or off duty at car stations; to equip all cars with air brakes and at least two motors, and to prohibit the leaving open of main line switches by car crews bound for the car houses, in the face of a succeeding through car loaded with passengers. Safety is of course an ever-present consideration, but it is by no means incompatible with alert work on the platforms and in the streets. Mileage by empty cars is certainly a source of serious loss, and our friends of the steam railroads have learned long since how to keep it down. Scarcely less efficient is the performance of a dawdling schedule by a car which might so easily make a clean, smooth run on every trip unless impeded by causes entirely outside its personnel and equipment.

The United Railways Company, of St. Louis, is planning to build its own cars in the future, and to that end is now increasing its shop facilities at Park and Vandeventer streets. The Milwaukee Electric Railway & Light Company, which is controlled by the same interests as the St. Louis property, is also planning to build its own cars, and expects to erect new shops for that purpose on a site which was purchased some time ago.

ELECTRIC RAILWAY IMPROVEMENTS AT KEY WEST, FLORIDA.

BY FREDERIC H. PORTER.

Key West is unusual in its location—the most southern and only truly tropical city in the United States. Its people and customs are more foreign than American, while the climatic and physical conditions of the island have an important bearing on the proper construction, operation and upkeep of its public utilities.



Improvements at Key West, Fla.—Using Churn Drills Preparatory to Blasting the Roadbed in Coral Rock.

Extraordinary Operating Conditions.

The Key West Electric Company is a consolidation of two electric lighting companies and a mule car company, which latter line was electrically equipped some eight years ago. The usual methods of construction then in vogue were followed, as the parties then controlling the company evidently desired to secure business with as little expenditure of money as possible. Small units in the power house belted to high-speed engines and the usual lack of appreciation of the business future of the property caused excess of operation costs and unsatisfactory service. To sum up the situation as it appeared some three years ago, when the parties then purchasing took control, there was nothing right about the property except the steel rails in the street and the cars running thereon, and some of the cars were forced to run in the wrong streets. Coal cost about six dollars per ton, delivered at the wharf, the power plant was a mile away, the railway lines were half a mile from the power house, and the car barn and repair shops were a mile distant. The usual form of span construction with wooden poles was employed for the overhead work of the railway and ties were conspicuous by their absence. It had been found that no untreated wooden pole would stand the effect of the climate, nor would any kind of iron, unless galvanized, and no matter how painted, keep from rusting.

Improvements at Key West, Fla.—Removing Coral Rock from Roadbed after Dynamiting.

Improvements at Key West, Fla.—Ballast Used in Extensions.

In spite of faulty operation, for which the local management could not at all be blamed, the company's income grew, but operation developed extraordinary conditions, incident to climatic conditions, such as the heat of the sun and the soaking rains, the deposit over everything of salt by the atmosphere, the nature of the coral soil of the streets, the inability to procure any water by any means suitable for boiler purposes except by distillation, which was too expensive, the high price of coal, and the well-established fact that no method of bonding known would for even a few months retain a contact between the copper and the steel, making the return current of the railway system a "ground" return in reality.

Improvements at Key West, Fla.—Subgrade Excavation in Solid Coral Rock.

The ownership of the company changed in 1903 and an attempt was then made to overcome the natural obstacles to economical operation and gradually to develop the property for the business in hand.

Engine Equipment.

As the price of coal was so high and decent boiler water was unobtainable, it was decided, after a thorough investigation and test, and with satisfactory guarantees on the part of the makers, to install the Diesel oil engines, and contracts were made with the American Diesel Engine Company, of New York, for Diesel engines. Two 75-brake-horsepower single-cylinder engines were first installed for the railroad load, and later two 225-brake-horsepower triple-cylinder engines were installed for the lighting load, and a third unit of 225-brake-horsepower is now under contract. This is the first plant in the United States to use Diesel engines for railway and lighting loads.

Improvements at Key West, Fla.—Using Churn Drills in Extended Order.

For purely local and temporary operative conditions these units were belted to a modern main shaft completely equipped with friction clutches and pulleys to admit the greatest possible flexibility of operation. The company, meantime, had acquired the property and business of the Key West Light & Power Company, whose generators, lines and line equipment were of a different voltage than used by the Key West Electric Company; hence many difficulties in operation resulted, with the different voltages prohibiting interchange of units or other usual flexibility of operation.

The use of the Diesel engines and other modern operative details resulted in greatly lessened cost of operation, as anticipated.

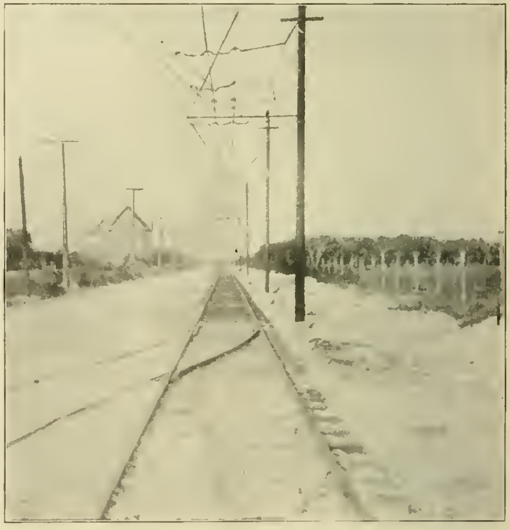
New Key West.

The commencement of the construction of the extension of the Florida East Coast Railroad from Miami over the Florida keys to Key West, a distance of 120 miles over the keys and across the intervening stretches of water and marsh; the beginning of the work of construction of the 12 great docks, each 800 feet in length, at Key West for the Key West terminus; the certainty that in due time Key West could cease to be an insular part of the United States, with customs and peoples peculiarly their own, and was about to become a most important seaport, with rail connections with the entire country; "36 hours from New York," according to the Flagler programme; the most southern railroad terminus in the United States, 250 miles nearer the entrance to the Panama canal than any other sea port; dominating the entire Cuban commerce and only 90 miles from Havana, with close financial and traffic arrangements with the interests controlling the Cuban railroads, all these aroused Key West to its certain future. Its advantages as a cigar manufacturing point have always been conceded and the coming of the railroad settled for all time its supremacy in that direction. Key West began to emerge from its tropical lassitude, important manufacturing interests began to construct immense and expensive factories near the northern portion of Key West Island heretofore uninhabited, real estate went up by leaps and bounds, and a "New Key West" sprang into existence.

To meet these conditions it became necessary to modernize and improve the power house, distributing lines for the light and power business, and to rebuild the city railway lines, as well as extend the railway system by the construction of a new line of about a mile and a half to serve the new factories and the New Key West. Good business demanded the most modern construction, especially designed to obviate the deterioration incident to the use of usual methods and materials at Key West. It is the purpose of this article to briefly note some of the incidents of construction and departures from usual designs embodied in this short line.

Excavating for the Roadbed.

The entire island of Key West is composed of solid coral rock covered with varying depths by surface soil of great richness. The railway extension was in part along a street not then accepted by the city, composed of the natural coral rock of the Island, with little or no surface soil. The balance of the line was at one side of a county highway recently constructed to the head of the island, and entirely upon the natural rock. The entire subgrade, aside from one morass which required a fill, had to be excavated from the solid coral rock to varying depths of 30 inches or more. Nearly 7,500 holes had to be drilled to permit the blasting with dynamite of the rock for such excavation. Air drills were not practicable for the work because of the compara-


Improvements at Key West, Fla.—Track and Overhead Construction at One End of a Turnout Showing Details of Double-Trolley Overhead—Return Wiring.

tive shallowness of each hole which would require more time to be lost in the moving and setting up of the drill from hole to hole, than in the drilling. Ordinary forms of rock drilling, either with short sledge and one man or long sledges and two men, required too much high-priced labor to be economical. The usual form of churn drill, as used in that section of the country, was employed with certain modifications.

The churn drill as first used was about six feet long, of seven-eighths-inch round iron, with tool-steel wedge-shaped point one inch wide. Under local foremen the men of the drill gang were bunched together in drilling, each man with his pail of water to "grease" the hole, and they averaged only about 20 feet of hole per day. A little experimenting led to increasing the width of the wedge face to 1⅛ inches and the length of the drill from 10 to 11 feet, thus getting a greater cutting edge and greater weight-effect in each drop of the drill. By separating the men of the gang, and the use of the improved type of drill, there was an increase in the average drilling to 40 feet per man per day of eight hours, and some made as high as 60 feet of hole.

Drilling three holes abreast across the width of the right of way, and repeating every three feet, and by the use of one-half to three-quarters of a stick of dynamite the coral rock was blasted most successfully. The top of the coral rock which has a greater hardness because of exposure to the atmosphere was broken by the blasts into large fragments easily rebroken into excellent ballast, while the bottom rock was pulverized into sand and easily removed with shovels, permitting a perfect shaping of the subgrade prior to placing ties.

The ties used were special heart, hard pine ties, treated with 12 pounds of creosote to the lineal foot and laid with two-foot centers on broken rock on the subgrade. The grade was filled with the finer rock-sand and finally ballasted with broken rock. The action of the air and water is gradually to solidify this construction into a homogeneous concrete mass, and being all laid upon a bed excavated from the solid rock it will be seen that a most durable construction was secured.

Improvements at Key West, Fla.—Setting Pole with Machine.

The rails were 60-pound, A. S. C. E. Carnegie roll, with staggered joints. The curves, turnouts and three-part Y were all special track work made by the New York Switch & Crossing Company, Hoboken, N. J., and laid on special length switch ties.

Improvements at Key West, Fla.—Transferring Pole-Raising Machine.

The chemical elements in the coral rock, the excess of saline moisture in the air as well as the great abrasive effect of the coral sand had so worn the best forms of special work theretofore laid, that it was clear such work at Key West would not have the average life as usually found in the north. Hence all the new work had special removable hardened steel centers.

The Double-Trolley Overhead-Return System.

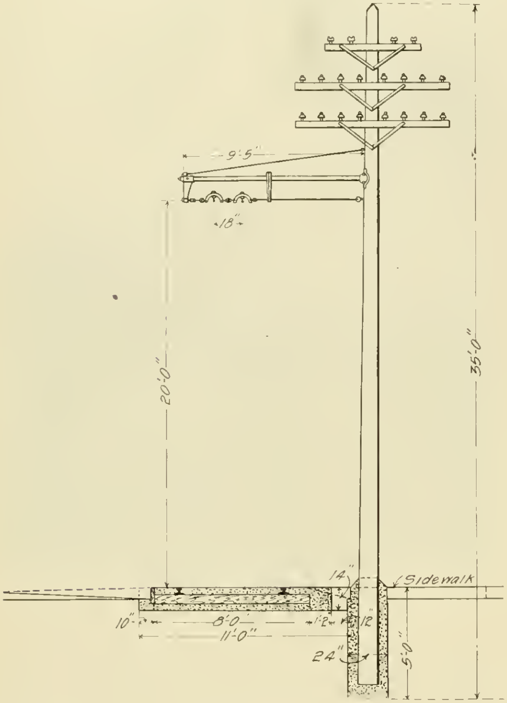
It had been found that there was no known form of bond which, after a few months use, would show proper contact with the rails in which the bonds were placed, as the peculiar chemical elements of the soil would so eat away and destroy the steel at the point of contact that the bonding was absolutely worthless.

In order to obviate the loss of current from the enforced use of the ground for a return circuit, and the troubles which might follow ultimate electrolysis as the city grew, it became evident that the double-trolley overhead-return system was the only system which could be used with any economy. But here came the usual and well known objections to the double-trolley overhead-return system as found in Cincinnati and elsewhere; also the peculiar leakage at Key West through or over the ordinary forms of strain insulators, because of the deposit even during dry weather, and especially at night, of a saline coating covering the insulator and eating into any joint or crack. This gave a rapid deterioration of the insulator and especially a leakage of the current through this deposit carrying the current around the insulating material.

The question of proper insulation of the two trolley wires was solved by the use of two Keystone double-curve hangers, with a double-clevis giant strain insulator bolted between them, giving 18 inches space between the two trolley wires. At each of the outer ends of the double-curve hangers there was bolted a regular giant strain insulator with the usual ⅜-inch stranded steel suspension wire made up into the eye-end of the giant strain insulator. The other ends of the suspension wire were made up into eye bolts in the poles in the usual manner.

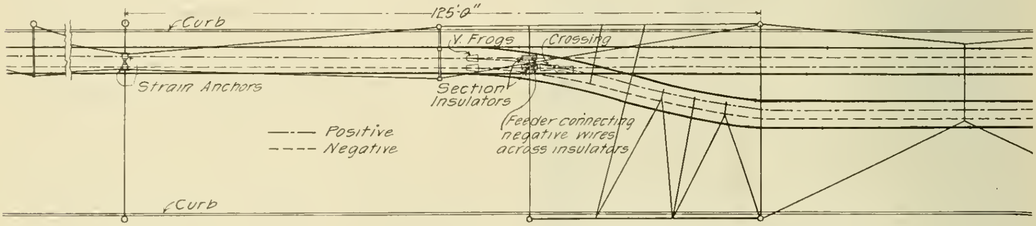
Arrangement of Wires on Curves.

Curve suspensions followed the same construction, substituting one single-curve hanger for one of the double-curve hangers, with the suspension wires arranged according to each special case.



Improvements at Key West, Fla.—Roadbed and Bracket Overhead Construction.

A system of breaking of circuits by the use of section insulators was adopted with the double-trolley overhead-return system to obviate the multiplicity of overhead wires at all special track work as found in Cincinnati and elsewhere, with which method of overhead construction there are at all special work and switch locations two supplemental wires strung on the inside of each curve, thus necessitating, on entering and leaving each switch, the transfer by the car conductor of both trolleys from the main trolley wires to the supplemental wires and vice versa.



Improvements at Key West, Fla.—Country Road Switch with Double-Trolley Overhead-Return System.

With this type of construction each V-frog and all wires connecting directly to it are of the same polarity; the positive wire, for instance, runs through the frog and out on both branches of the curve, but ends in a section insulator on one branch and continues positive in the other branch. The extension of the first wire through the section insulator becomes the negative wire until the other end of the switch is reached, when another section insulator performs a like service, and the original arrangement of positive and negative sides is restored. Four section insulators are employed to each switch. That portion of the trolley wire cut off by the section insulators is, of course, fed across from the regular circuits by an overhead "feed-in" from one insulator to the other. This occasions a reversal of polarity the same as in the circuits at Cincinnati, but does away with all supplemental wires, and in operation, with the necessity of the conductor transferring the trolley back and forth.

The system has been found to work with perfect satisfaction. No cross is possible should the trolley poles leave the wires at any point, because the two poles are mounted on a special double-pole trolley base with a common center. No cross is possible at the frogs because all wires connecting with a frog are of like polarity for a sufficient distance away from the section insulator so that if a trolley pole should leave the wire at or near the frog it can only touch wires which are of like polarity and therefore no cross will result.

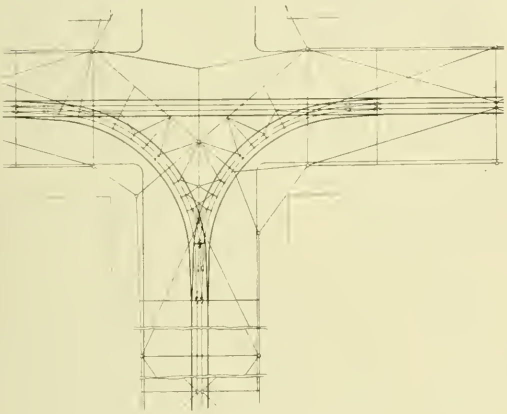
Method of Anchoring.

The entire line is thoroughly anchored with pairs of strain suspension anchors, separated by a special giant strain insulator and having regular giant strain insulators at each of the four outer corners of the two anchors, into which the stranded suspension wires are made up. These are, in turn, made-up into turn-buckles hooked into eye-bolts in the poles. Such strain anchors are used at each end of every curve and switch, also every 1,200 feet along the line. The result of this system of overhead construction is a line which will admit of high speed and remain in alignment and service for years with the minimum of repairs and attention.

Especially is this emphasized when it is remembered that the overhead work is supported by 30-foot hard pine poles, with 12 pounds of creosote to the lineal foot; 12 inches in diameter, 6 feet from the butt, and having 7-inch tops. These poles were set 5 feet in the ground in holes excavated in the solid rock, the rock being loosened by blowing with one stick of dynamite after being drilled with a churn drill as in the sub grade excavation. The poles are bedded on six inches of concrete (one-three-five mixture) and surrounded by the same concrete six inches in thickness, to and even with the sidewalk level, beveling to nothing six inches above the sidewalk level. Hot creosote was poured between the pole and the concrete in any opening that appeared through shrinkage of the concrete. The fronts of the concrete bases were squared to conform with the city curb where it projects above the street level.

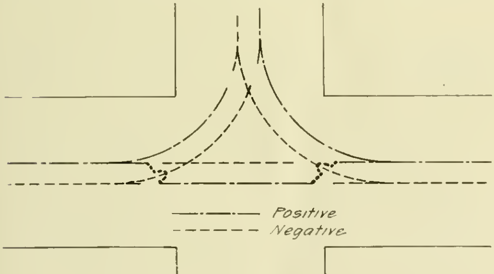
A very thorough system of pole guying was used with one-half-inch stranded wire, and especial care was taken at all switches, curves and special work to insure rigid construction in all details.

Special No. 00 figure eight trolley wire was used, supported by Keystone mechanical ears for straight line suspensions and soldered ears for curve suspensions. Span construction was used for about half a mile, but along the county highway where the track is at one side of a 50-foot street a single line of poles was used with the bracket arm suspension.



Improvements at Key West, Fla.—Plan of Span Wires and Pull-Offs for Three-Part Y.

The regular form of construction was used with the brackets as on the span work, except that a novel method of arrangement of anchor wires was adopted. The anchor wires attached to the strain anchors on the pole side run to the next poles in the usual fashion; the anchor wires on the outer side run to the ends of the next bracket arms on each side of the anchors. Here they are attached to the usual turn buckles hooking into one eye of a double-eyed strap fitting over the end of the bracket arm. From the other eye and the turnbuckle attached thereto a stranded strain wire runs back to the second pole from the anchor. To counteract the uplift of the strain wires upon the bracket arms a piece of tubing is inserted in one leg of a 45-degree Y-fitting, the other leg of which is slipped over the bracket arm and bolted thereto. The upper end of the tube is flattened and bent at an angle, drilled and fastened to the pole by suitable lag screw. This gives a diagonal brace between the horizontal bracket arm and the vertical pole, and prevents the strain of the anchor wires pulling the bracket arm upward and out of line.



Improvements at Key West, Fla.—Diagram Showing Arrangement of Positive and Negative Wires on Three-Part Y for Double-Trolley Overhead-Return System.

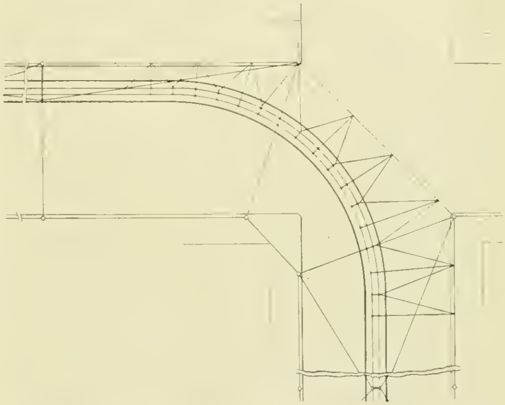
This construction obviates carrying the outer anchor wires over the highway to special poles placed on the side of the street opposite the track. The latest type of metallic crossings were used in all cases. All the metal in the overhead construction was heavily galvanized.

Construction Details.

Aside from the regular linemen of the company a total lack of skilled labor was encountered in the erection of this work, and some of the appliances for construction were made on the ground to serve the purpose as well as possible.

The poles were exceedingly heavy for their size, each pole holding something like 360 pounds of oil, with a total weight per pole of 1,250 to 1,300 pounds. To facilitate the raising of the poles a derrick was constructed from the material at hand. This tool consisted of a winch mounted on a low, heavy truck, with an A-superstructure rigged with suitable blocks whereby the poles were easily raised, lowered, set and adjusted in position.

Since only this extension of the railway system of the Key West Electric Company was fitted for the double-trolley overhead-return system (the old portion is still using the single trolley, ground-return) it, of course, became necessary to place suitable switches in the cars, so that they could be used with either system as required. Suitable switches were also installed at the junction of the old and new lines. The construction of the overhead work for the three-part wye involved some peculiarities because of the use of the double trolley wires spaced 18 inches apart, the necessity for keeping the trolley wires in parallel throughout as well as in uniform tension, and some physical conditions such as existing telephone poles which had to be used, and the location of certain buildings.



Improvements at Key West, Fla.—Right-Angle Curve with Span and Bracket Construction Showing Arrangement of Overhead.

The operation of this extension, embodying this construction has been in every way satisfactory to the company and popular with the public. Soon after the completion of this extension the property of The Key West Electric Company was purchased by Stone & Webster, of Boston, and it is understood that they are carrying out the plans of the former owners, who had ordered 60-cycle, two-phase alternators for direct connection to the Diesel engines, as well as a reserve unit for the railroad load, together with modern switchboards and instruments.

It is proposed also to install the double-trolley overhead-return system throughout the city. An entirely new system of pole lines and distributing circuits for the light and power business will be installed, the poles for which are already on the ground. The curves of the old railway system are being eased, new switches and special work will be placed, and the property put in first-class condition.

The plans for the double-trolley overhead-return system and the improvements in the power house were made jointly by Frederic H. Porter, 15 Wall street, New York, and Dallas, Texas, and Mr. O. C. G. Urban, manager of the Key West Electric Company at Key West. The construction work of the railway extension was done by Messrs. Ferguson & Ward, of Key West, as contractors, under the direction of Mr. Porter, as engineer of construction.

GLASGOW CORPORATION TRAMWAYS ACCOUNTS.

The report of the tramways committee of the Corporation of Glasgow for the year ending May 31, 1906, has been published and shows income and expenditure as follows (figures for the preceding year are shown for comparison):

	Year to May 31, 1905.	Year to May 31, 1906.
Traffic receipts	£756,480	£813,769
Other receipts	8,310	7,170
Total income	£764,790	£820,939
Working expenses (excluding depreciation)	387,167	456,269
Balance to net revenue	£377,623	£364,670
Interest on surplus	3,113	4,745
Net income	£380,736	£369,415
Deductions from income	287,438	312,997
Net balance	£ 93,298	£ 56,418

The deductions from net income in the foregoing statement include:

	Year to May 31, 1905.	Year to May 31, 1906.
Interest on capital	£ 49,906	£ 54,787
Sinking fund	46,919	48,327
Depreciation	81,115	84,303
Permanent way renewals fund	72,177	75,584
Payment to common good	25,000	25,000
	£275,117	£290,001

The net balance was appropriated as follows:

Special depreciation	£ 68,500	£ 10,000
Additional to common good	.....	10,000
General reserve	24,798	36,418

The Tramways committee had borrowed May 31, 1906, the sum of £1,731,889, and had unexhausted borrowing powers of £870,499. The total borrowing powers given under 11 different acts of Parliament were originally for a total of £3,100,000, which by operation of sinking funds has been reduced to £2,602,398.

The capital account was increased during the year by £207,967, making the total £2,971,348.

The depreciation of the permanent way renewals fund on May 31, 1906, was £905,253. The appropriation made to this fund for the fiscal year was £169,886 and there was expended from it during the year the sum of £42,270.

The general reserve fund during the year was credited with £36,418 from surplus revenue and £15 from the sale of obsolete equipment. During the year there has been expended from the general reserve fund, £29,581 for the alteration of buildings, electrical plant, etc., leaving the balance of this fund May 31, 1906, at £39,442.

The following facts from the report will be of interest:

The extensions made since June 1, 1905, measured by miles of streets, aggregate 6.761; and the total length of track now owned and leased is 168.483 miles. This is practically all double track, the length of streets occupied being 80.86 miles. Of the total track 102.30 miles are within the city of Glasgow and the rest within various other boroughs and counties.

During the year £65,914 was expended on the upkeep of track and the ordinary repairs. This is in addition to the sum of £75,584 laid aside to meet the cost of renewals, which is at the rate of £500 per mile of single track. As before stated the amount spent on renewal of track, £41,908, was deducted from the permanent way renewals fund.

The amount expended for repairs of buildings during the year was £6,503, which was charged against revenue. To meet the depreciation on buildings for the year there was set aside £10,403 and a special additional sum of £10,000. On power plant and sundry machinery, repairs amounted to £3,354 and £19,402 was charged against revenue to meet depreciation.

The taxes assessed against the tramways are being increased year by year and for the fiscal year covered by the report the total amount was £43,924, as against £38,782 for the preceding year.

Three of the most interesting accounts to which reference has been made a number of times follow, figures being given to nearest pound sterling:

DEPRECIATION AND PERMANENT WAY RENEWALS FUND ACCOUNTS.

Credits.	Balance May 31, 1905.	Credits for Year to May 31, 1906.	Total
Permanent way	£251,882	£ 75,584	£327,466
Electrical equipment of line	178,830	15,578	194,408
Buildings and fixtures	114,364	10,403	......
Buildings and fixtures (special)		10,000	134,767
Power station and substations plant	100,681	19,402	120,083
Workshop tools and sundry plant	8,295	1,936	10,231
Cars	60,060	19,817	79,878
Electrical equipment of cars	50,107	14,646	64,752
Other rolling stock	1,926	797	2,723
Miscellaneous equipment	7,807	1,336	9,143
Office furniture	2,639	387	3,026
Govan and Ibrox tramways	1,046	......	1,046
Total	£777,637	£169,886	£947,523

Debits—	
Expended on permanent way during year ended May 31, 1906	£ 41,908
Depreciation on assets realized	362
Balance	905,253
	£946,523

SINKING FUND ACCOUNT.

Credits:	
Balance, May 31, 1905	£449,275
Addition from revenue for year to May 31, 1906	48,327
	£497,602
Debits:	
Applied in reduction of debt to June 30, 1894	£201,470
Applied in reduction of debt July 1, 1894, to May 31, 1905.	247,805
Applied in reduction of debt June 1, 1905, to May 31, 1906.	48,327
	£497,602

GENERAL RESERVE FUND ACCOUNT.

Credits:	
Balance, May 31, 1905	£ 32,590
For year ending May 31, 1905	36,418
Profits from sales of obsolete plant	15
	£ 69,023
Debits:	
Head office reconstruction (part written off)	£ 7,046
Alterations, Dennistoun depot	5,570
Lowering tracks under bridges	4,270
Dalhousie substation switchboard alterations	3,395
Coplawhill substation switchboard alterations	2,215
Erecting stages at depots	1,500
Coplawhill depot buildings	326
Raising wires at bridges	273
Raising level of tracks	140
Preliminary expenses	4,845
Balance	39,442
	£ 69,023

STATEMENT OF OPERATION DETAILS.

Car-miles	18,886,910
Car-hours	2,646,512
Passengers carried	208,059,833
Kilowatt-hours used for traction and car lighting	22,350,303
Kilowatt-hours used per car-mile for traction and car lighting	1.18
Average cars in use for 14-hours day	517.91
Ratio of working expenses to total receipts	.5526
Average traffic revenue per car-mile	10.34d.
Average traffic revenue per car-hour	73.8d.
Average traffic revenue per mile of single track	£5,062
Average traffic revenue per head of population served	15s.6d.
Average total revenue per car-mile	10.43d.
Average car miles per day per car	99.91
Average speed per hour (miles)	7.42
Average car-hours per day	7,250.72
Average working expenses per car-mile (excluding power works cost)	5.45d
Average working expenses per car-mile (including power works cost)	5.80d
Average working expenses per passenger (including power works cost)	.53d.
Average working expenses per car-mile (including power works cost and amount expended on permanent way renewals)	6.33d.
Average working expenses per car-mile (including total power cost and amount expended on permanent way renewals)	7.78d.

Scale of fares:	½d.	1d.	1½d.	2d.	2½d.	3d. and over.
Average distance (miles)	.57	2.28	3.44	4.57	5.74	...
Percentage of total passengers	15.63	64.03	11.19	4.25	1.75	3.17

Average fare paid per passenger	.94d.
Average number of passengers per car-mile	11.02
Average journeys per head of population per annum	198.15
Number of cars in stock	783

MANCHESTER CORPORATION TRAMWAYS.

The annual report of the tramways committee to the city council of Manchester, England, shows the revenue account for the fiscal year ended March 31, 1906, and comparison with the preceding year, as follows:

	1904-5.	1905-6.
Traffic revenue	£628,529	£661,806
Other revenue	3,426	1,901
Total	£631,956	£663,707
Working expenses	411,597	433,561
Gross profit	£220,358	£230,146
Add bank interest	1,869	1,952
Balance	£222,227	£232,098

Out of the balance there was charged:

Interest on mortgage debt	£ 52,120	£ 48,732
Redemption of debt	35,379	38,595
Rent of tramways	10,000	17,250
Leaseholds	795	931
Income tax	2,983	6,418
	£101,278	£111,926

From the net balance there was appropriated:

Renewals and depreciation	£ 70,907	£ 70,082
In aid of rates	46,000	46,000
Street improvements, interest, etc	4,043	4,090
	£120,950	£120,172

The following statistical information for the fiscal year will be of interest:

Total borrowing powers	£1,957,461
Borrowing powers exercised	1,550,874
Gross capital expenditure	1,675,812
Miles of track owned	108,443
Miles of track leased	36.198
Miles of streets covered	82.627
Miles of track operated over	151,367
Population served by tramways (approximate)	750,000
Car-miles	14,655,908
Passengers carried	133,923,932

The distribution of passenger traffic, according to fare paid, is as follows:

Zone fare.	½d.*	1d.	1½d.	2d.	2½d.	3d.	3½d.	4d.
Percentage of passengers	6.25	70.67	11.57	6.94	2.01	1.57	.67	.32

Total number of kilowatt-hours used	22,164,445
Kilowatt-hours per car-mile	1.53
Ratio of working expenses to receipts	65.3
Average traffic revenue per car-mile	10.84d.
Average traffic revenue per mile of single track	£4,452
Average total revenue per car-mile	10.87d.
Average car-miles per day per car	95
Working expenses per car-mile excluding power cost	5.0d.
Working expenses per car-mile including power cost	7.1d.
Average fare paid per passenger	1.19d.
Average number of passengers per car-mile	9.14
Average journeys per head of population per annum	178
Total amount of sinking fund	£ 104,655
Sinking fund applied in reduction of debt	£104,655
Renewals and depreciation fund	£249,212

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*½d. fares on circular and cross routes only, not on main lines.

NEW PUBLICATIONS.

Stray Currents from Electric Railways.—By Dr. Carl Michalke, Ober Ingenier. Translated and edited by Otis Allen Kenyon. Cloth, 101 pp., 5½ by 8 in. McGraw Publishing Company, New York City, 1906. Price, $1.50 net.

This book is a theoretical treatment of the subject of electrolysis. At the present time the engineers of many municipalities are endeavoring to remedy damages to underground structures attributed to stray currents. The subject is one on which comparatively few books have been published in the United States. As the load upon the power houses in various cities increases and as the track-bonding of existing railways loses efficiency, the effects of stray currents become more pronounced. For this reason the problem grows more important from year to year.

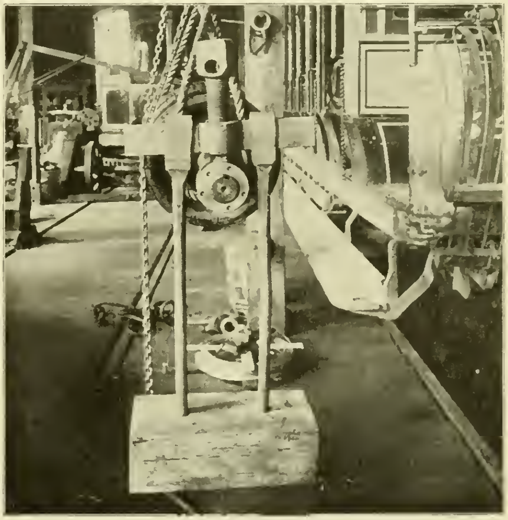
The first few chapters of this book present methods for calculating the stray currents on tracks loaded both uniformly and otherwise. Other chapters treat of corrosion and the probable path of stray currents between track rails and underground structures. In the last few chapters suggestions are made as to proper methods for preventing the destructive effects of stray currents.

It can hardly be expected that municipal engineers shall be fully conversant with the mathematics of stray currents and therefore any treatment of the subject which will place at their disposition a few well-chosen formulae by the use of which the quantities to be dealt with can readily be determined, should be valuable. The condensed treatment of this subject as here presented should, for the same reasons, be of value to electric railway engineers.

STRAIGHTENING ARMATURE SHAFTS.

In the shops of the Lima & Toledo Traction Company, Lima, O., a satisfactory method of straightening bent armature shafts has been developed. The work is done quickly and accurately, and without apparent injury to the shaft. No heat is used on the parts to be straightened, though many of the shafts have a diameter of 3⅝ inches. The accompanying illustration shows an armature in position for having its shaft made straight.

The disabled armature is lifted into two pedestals designed to fit into the bed of the shop lathe. The pedestals are cast of gray iron and have their upper surfaces hollowed and filled with babbitt so as to fit snugly about the shaft. One of the pedestals is placed near the commutator end of the shaft and the other near the pinion end. When the shaft is in position its pinion is replaced by a steel collar which serves as a protection for the pinion threads at the end. By means of surface gauge and calipers the point where the shaft is sprung out of true is ascertained and the pedestal is shifted on the shaft to that point so that it may act as a fulcrum in the straightening process.



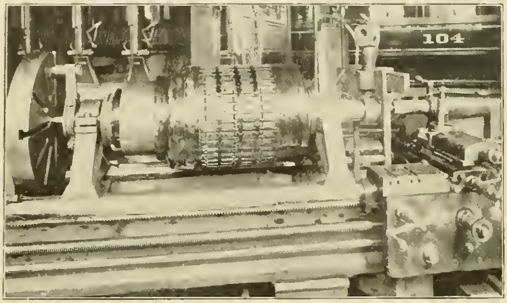
Yoke for Straightening Armature Shafts.

The pedestal by which the commutator end of the shaft is supported is securely bolted to the bed of the lathe. The two parts of the pedestal are firmly bolted together so as to hold the shaft into position when pressure is applied at the pinion end.

When in position at a height corresponding to the line of the centers of the lathe grips, a yoke is slipped over the shaft. The yoke, as shown in the accompanying illustration, consists of a pressure screw with a longitudinal arm attachment, to which long vertical bolts 1⅛ inches in diameter are suspended. The pressure screw is placed on the temporary collar and the bolts are led through the bed of the lathe and into a block which aids in keeping the yoke in position. When force is applied to the screw the upward pressure of the block and the downward weight on the bed are equal. By this arrangement the danger of breaking down the lathe is eliminated.

When the shaft is in position with the highest point supporting the pressure screw, and the lowest point resting on the fulcrum pedestal pressure sufficient to spring the shaft into line is applied by the pressure screw. With the pressure applied the shaft is left standing for several hours until the shaft centers remain in their normal position.

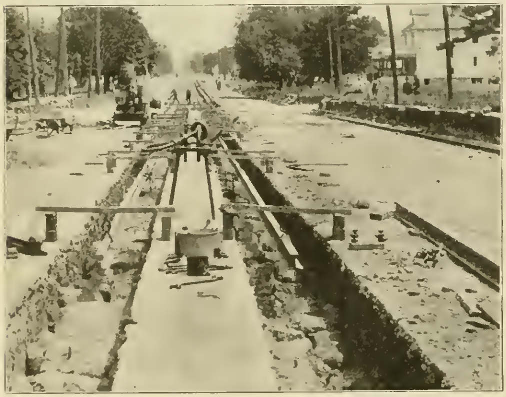
Since this method was adopted a shaft thrown out of true in two directions has been straightened without any noticeable effect in its durability. By the same method, it is claimed, a shaft bent inside of the armature frame can be straightened without injury to the discs. In this case a hard wood block resting on the frame of the lathe and supporting the armature would be used as the fulcrum. The point of pressure would also, in this case, be made at the pinion end of the shaft.



Aramture in Lathe Ready for Straightening.

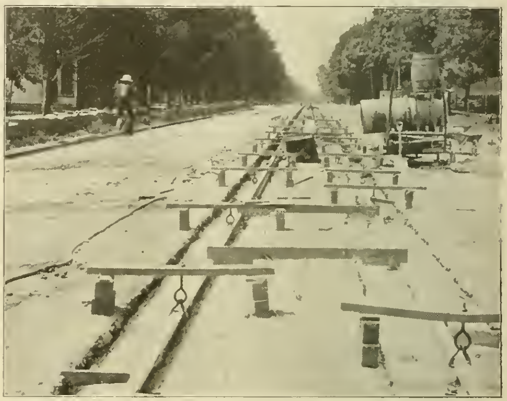
NEW METHOD OF TRACK CONSTRUCTION AT OWOSSO, MICH.

In rebuilding its lines in the city of Owosso, Mich., the Owosso & Corunna Electric Company has adopted as a standard track construction for paved streets a 70-pound A. S. C. E. section steel rail laid on concrete stringers 28 x 28 inches in cross section. No cross-ties or tie-rods are used. The concrete for the stringers is mixed and placed in proportions of 1 to 12 at the bottom, 1 to 8 at the center and 1 to 4 at the top of the stringers. The mixture is run into the trench in a liquid state and is allowed to dry thoroughly before supporting the weight of the rails. After the stringers are completed three weeks are allowed to elapse before cars are run over the new construction. The method of laying the rails is shown in the accompanying illustration. When the trench for the stringers is made the rails are placed in position on grade and at gauge and held suspended by clamp ears supported by 2 x 4-inch timbers, which in turn are blocked up at the proper height at the ends. While the rails are thus suspended the concrete stringers are laid, the upper surfaces being brought up flush with the flange of the rails. Anchor bolts ¾ inch in diameter by 12 inches long are embedded in the stringers every four feet on alternate sides of the rail. At the upper end of the anchor bolts clamp castings which fit over the flanges of the rails are provided for holding the rails in position. At the rail joints cast-iron base plates 10x16x1½ inches are fitted to the rail and embedded in the concrete. Bolts also extend from the corners of the plates down into the stringers, giving the rails a very solid foundation at the joints.



Track Construction at Owosso—Rails Suspended above Trench.

Three years ago the tracks of this company were laid on concrete stringers which did not stand up as well as was expected. The concrete for the stringers was mixed in proportions of 1 to 12 and soon crumbled and allowed the track to settle and get out of alignment. The work now in progress is in anticipation of handling the interurban cars which it is expected will be running into the city inside of another year, the Owosso & Corunna Electric Company having secured right of way for the extension of its line from Corunna to Durand, a distance of 12 miles. Other lines are projected to Grand Rapids, Lansing and Saginaw, with Owosso as the radial point.



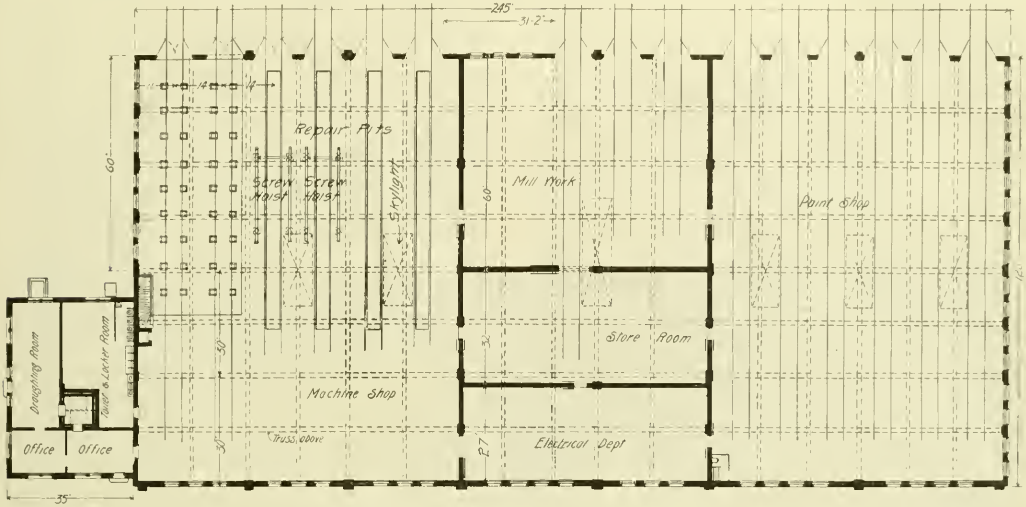
Track Construction at Owosso—Rails in Concrete in Place.

Union Internationale de Tramways et de Chemins de fer d'Interet local.

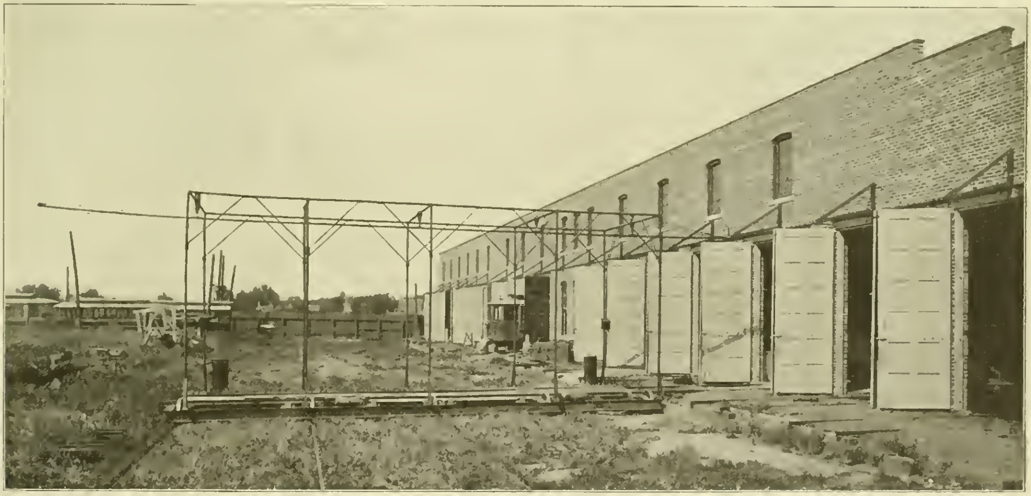
The responses to questions which will be discussed at the Fourteenth General Assembly of the International Congress of Tramways and Railways of Local Interest to be held at Milan, Italy, September 17 to 21, 1906, have been published. There were eleven questions submitted to the members and the compilation of responses received makes a book of 650 pages, 8 by 13 inches. These questions relate to regulation of continuous-current railway motors, brakes, urban track construction, gauge of tracks, speed, application of electricity to light railways, steam turbines, gas engines for railway power plants, relative advantages of the different systems of supplying current to electric railways, measuring instruments on cars, and track for light railways. The office of the secretary general is 6 Impasse du Parc, Brussels, Belgium.

NEW REPAIR SHOP OF THE OMAHA & COUNCIL BLUFFS STREET RAILWAY COMPANY.

During the past few years the traffic on the lines owned and operated by the Omaha & Council Bluffs Street Railway Company has steadily increased. To care for this traffic it has been necessary to purchase each year approximately 20 cars. Until recently repairs to the rolling stock have been made at the several operating barns scattered about the property. During the past year, under the supervision of the master mechanic, Mr. H. B. Noyes, there has been erected a repair shop, the construction of which, together with some of the operating methods practiced, presents several interesting features.



New Shops at Omaha—General Plan of Building.



New Shops at Omaha—Entrance to Shops and Storage Yard Showing Transfer Table.

The new shop building is located at the corner of Twenty-sixth and Lake streets, Omaha, Neb. The building construction is of the mill type with concrete foundations, colonial brick walls, and a composition roof supported by built-up timber trusses. The several shops are located in subdivisions of a rectangular structure 245 feet long by 120 feet wide. Brick fire walls subdivide the general structure into the several shop rooms. At the south end of the shop building connecting with the machine shop is a one-story wing accommodating two offices for the master mechanic and his assistants, a drafting room, and a toilet and locker room. The basement under the offices is walled and floored with concrete and contains the boilers of the steam heating plant.

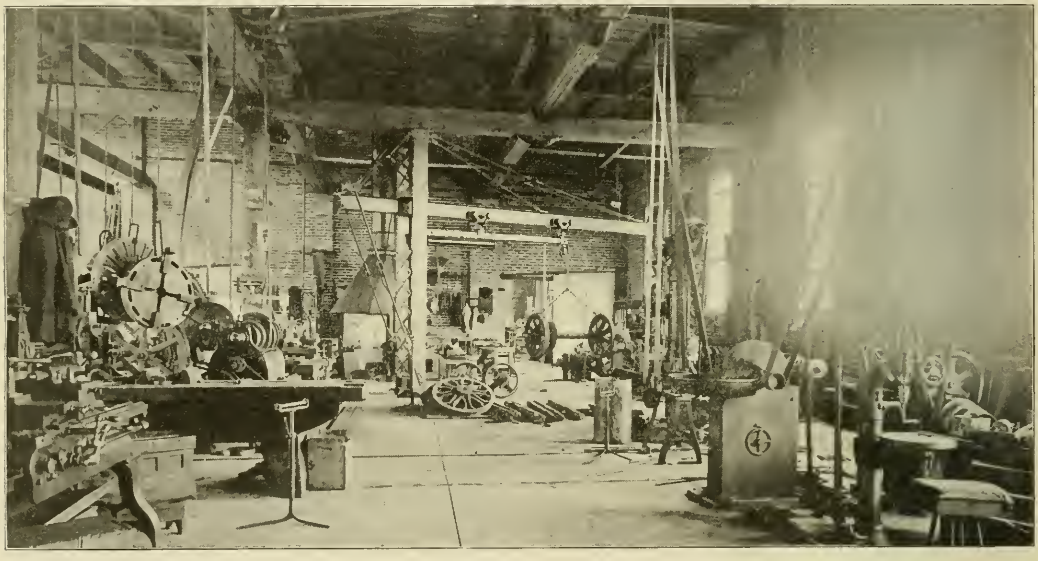
The present structure is of ample size to maintain the equipment which will be needed for the property during the next few years. The shops are so arranged with a transfer table along one side that, when the equipment demands it, a building of like size may be erected on the opposite side of the transfer table, which then can economically serve both buildings. There is sufficient land owned by the company at the end of the present structure to permit of the present shop building being extended to twice its length as well as for the structure which may be erected on the opposite side of the transfer table. It is thus seen that, when conditions warrant, there are accommodations (shop grounds 412x630 feet) for shops with four times the floor area of the present building and a storage yard 100x630 feet.

Machine Shop and Equipment.

The machine shop at the south end of the building accommodates, besides the complement of tools, six pit repair tracks, of which four are of standard construction and served by Pittsburg car body hoists and two are of an interesting type of open construction. An accompanying illustration is a view of the machine floor. The machine shop accommodates the following tools: 200-ton electric-driven hydraulic wheel press, electric-driven punch and shear, one 16-inch and one 10-inch drill press, power hack saw, drill and surface grinder, wet tool grinder, bolt machine, 24-inch shaper, 18, 24 and 36-inch lathes, bed planer, angle bender, blacksmith twin forges, air hammer, and various portable air-driven tools.

The entire shop is supplied with compressed air piped to taps at convenient points. Pressure for this system is maintained by a horizontal air compressor with a 10x10-inch cylinder. This compressor is driven by two Lorain car motors mounted nearby and belted to the flywheels. The compressor discharges into a vertical storage tank nearby. Its operation is regulated by an ingeniously devised controller which was built in these shops. The current for driving the air compressor motors after passing through a circuit-breaker has its circuit made and broken by the contact points of a Christensen air-brake governor, the coils of which have been rewound to suit the heavy current needed for the two street car motors which drive the compressor. When the pressure falls below a predetermined point, this governor closes, and with the completing of the circuit a solenoid is excited so that its core operates a valve and admits air to a long cylinder mounted on the control board. On the top of the piston in this cylinder is a contact bar which, as it is slowly raised with the air, successively passes by a number of controller fingers connected with sets of resistance such as are used in the car equipments. As the contact bar passes these fingers the starting resistance is cut out and when the bar has reached the upper limit of its travel contacts are closed which places the air compressor motors directly across the line. With the closing of these contacts a heavy magnet is energized and holds the contact bar in its upper position. Meanwhile, the air is allowed to leak out of the cylinder so that when the governor cuts off the contact bar will drop quickly.

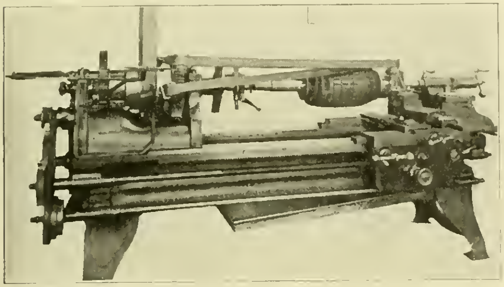
As the air compressor is near the steel storage tank of the building water supply system into which water is fed from the city mains, advantage is taken of this location and the lower side of the cylinder jacket is connected with the bottom of the water supply tank, while the top of the jacket is connected with the top of the supply tank. In this way a natural water circulation is afforded for cooling the cylinder with a simple piping arrangement having connections similar to those of a hot-water heating tank and a kitchen range. The output of the air compressor set is used in the various shops for air hoists, drills and hammers, gas forges, sand blasting glass, burning paint, and cleaning cars.



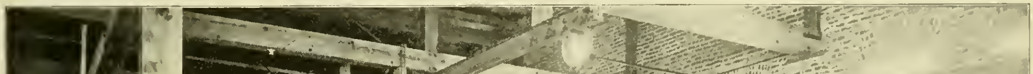
New Shops at Omaha—Interior of Machine Shop Showing Jib Crane for Serving the Larger Machine Tools.

The heavier machine tools are served by a jib crane which was designed and erected in these shops. This crane, which is shown in the accompanying illustration, has a working radius of 17 feet. The lower side of the boom is 10 feet from the floor level. The main post of the crane turns in two sets of roller bearings which formerly were used on an experimental car, the upper bearing being held by one of the roof trusses. The trolley which travels along the boom supports at its outer end a sheave over which runs the hoisting chain. Power for raising and lowering the load is obtained by means of a six-inch air hoist mounted horizontally on the trolley, so that its piston has a direct pull on the hoisting chain. By the horizontal arrangement of the air hoist increased head-room is afforded, and when lifting material to and from the wheel press or lathes the piston of the air hoist does not interfere with the tools. This crane has a working capacity for a load of 5,000 pounds.

An accompanying illustration is a view of the two open-pit repair tracks. The rails of these tracks are supported on reinforced concrete piers spaced approximately seven feet between centers along the rail. The concrete of each pier is capped with cast iron so that the rails have a rigid seat. Anchor bolts from the caps extend through the center of the piers and connect with old rails bedded in the concrete floor of the pit opening. This opening is 71 feet long and 30 feet wide. Every other pier on alternate sides of the track has two recesses near its top, one on either side, for an incandescent lamp, and a system of armored conduits connects the various outlets with the wiring circuits of the building.


New Shops at Omaha—Machine Lathe with Attachment for Slotting Commutators.

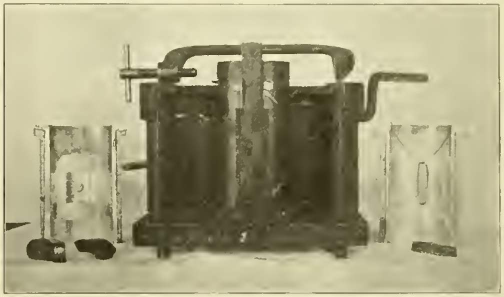
It will be noted that in the illustration of the open pits a pair of wheels is shown lowered part way from the car to the pit floor. To facilitate this work of replacing wheels and parts of trucks short sections of track rails are supported at one end by means of pivots extending into the center of the concrete piers, the other end of each section remaining free to be swung at will from its normal place in the track to a position at right angles to the fixed rails, which furnishes ample clearance for making repairs or replacing truck parts.



New Shops at Omaha—Repair Floor Showing Rails Mounted on Concrete Piers and Swinging Rails for Facilitating Truck Repairs.

Each of the pairs of repair tracks is served by an air hoist traveling on the lower flanges of an I-beam parallel with the tracks.

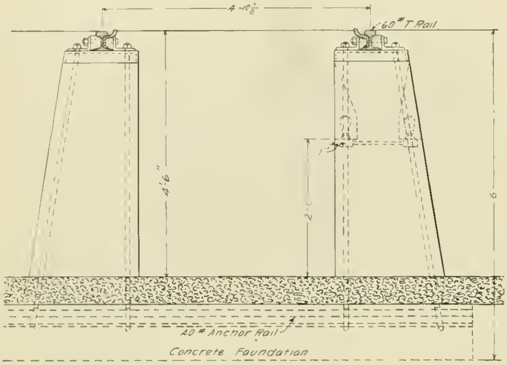
As will be noted in one of the illustrations all the tracks in the shop building are served by a transfer table. This table travels along the entire length of the west side of the building and is driven by two Lorain car motors geared to one axle. The wheels on this axle are 24 inches in diameter and the idler wheels on the other axle are 18 inches in diameter. In order to increase the tractive effect on the driving wheels the track on the transfer table has been offset to the side nearer the driving shaft. The motors are controlled by two boxes placed at diagonally opposite corners of the table. The overhead structure on the transfer table is so arranged that no attention need be given the trolley of the transfer table nor of the car on the table while it is being shifted to or from the various tracks.


New Shops at Omaha—Moulds for Babbitting Journal Bearings.

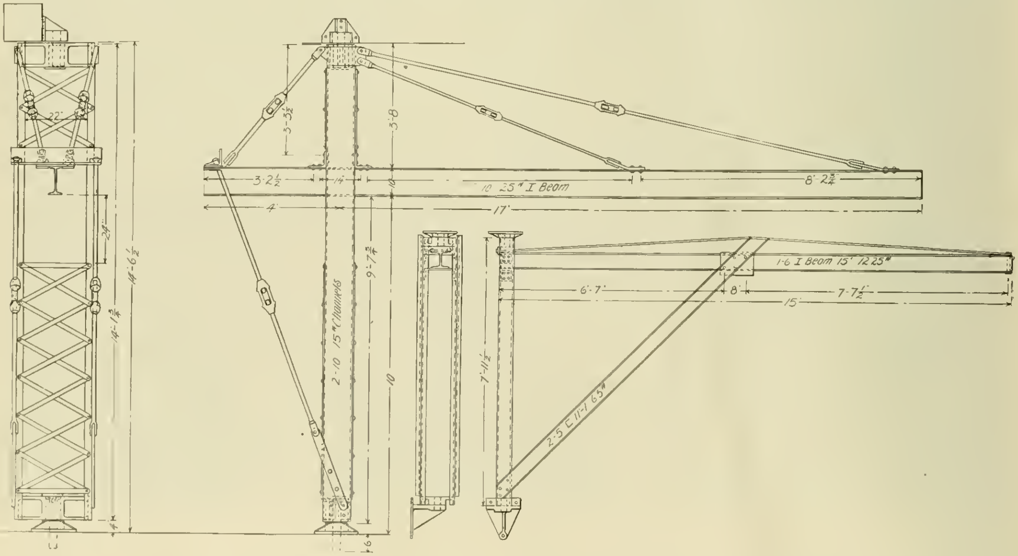
Armature and Bearing Department.

The room in which the winding of armature and field coils is done and where the babbitting outfit is placed is 60 feet long by 30 feet wide. Besides the necessary tools for repairing the electrical parts this room contains a babbitt-melting furnace with a gas heating attachment and the various moulds used for babbitting bearings. An accompanying illustration shows a special mould which has been made for babbitting the motor-axle bearings. This mould casts the two halves at once, but independently, so that the halves are interchangeable.

A change has been made in the oiling arrangement for the bearings of the older type motors. In these old style axle bearings there were two recesses at one side for accommodating a felt oil wiper and its spring, the oil being held in a cistern in the axle bearing cap. In the present practice the bearings are cast with two openings in the bottom of the half, each about one and a half by three inches in area. These openings are around the shaft when the bearing is in place. The holes are also directly over the oil well, so that it can be packed with wool waste, which when saturated with oil expands from its own elasticity and by capillary attraction keeps the under side of the axle in contact with the oil. An advantage of this method of oiling is that by the absence of springs there is no opportunity for scratching the shaft should the felt wear out, which frequently happens on the axle bearings being exposed to the dust.



New Shops at Omaha—Details of Repair Track Supports.



New Shops at Omaha—Jib and Bracket Cranes Built and Erected at Omaha Shops.

It has been found satisfactory practice with this company not to keep armature bearings to standard sizes. When the commutators have been turned, if the bearing is out of shape it is "skinned up" without attempting to keep it to standard size. Then the bearings are machined to fit the shaft, and when a bearing is once fitted it is kept with its shaft.

It has also been found satisfactory practice to cut out the mica between the commutator bars on the G. E.-52 and G. E.-57 motors. The mica is removed to a depth of $\frac{1}{16}$ of an inch by a one and a half-inch slotting saw mounted in a block that can be set in the tool rest of the 24-inch lathe, which is one of the tools in the armature room. This slotting saw is on a vertical shaft which carries a pulley at its upper end. The shaft is driven by a narrow belt from the large wheel on the lathe cone, the belt being guided by wheels mounted on wrought iron brackets fastened to the bed of the lathe. The bracket supporting one of these wheels is pivoted and has a spring attached to it so that the belt is kept in tension as the slotting wheel is moved forward and backward along the commutator in the lathe centers. By means of these attachments it is possible to properly cut out the mica between the commutator slots in about fifteen minutes time.

The armature room is equipped with a coil taping machine, dipping tanks, and winding machines for both armature and field coils. There is also a testing board with water barrel resistance. A bracket crane of 1,000-pounds capacity and 15 feet radius with an air hoist attached serves to transfer the heavier work about the armature repair floor.

Miscellaneous Shops.

Adjacent to the electrical room is a storeroom provided with suitable racks for storing the various supplies for the shop. Under the storeroom is a fireproof basement for oil and paint. In this room are six tanks with measuring pumps and outlets on the floor above. One tank for the storage of gasoline is buried outside of the building. This oil supply system was manufactured by Bowser & Co., Inc.

On the west side of the building opposite the storeroom is a room set apart for mill work. This room is 60 feet wide by 70 feet long and has three tracks extending across it, one of which enters the storeroom. The tools in the mill room consist of a band-saw, shaper, cabinet-maker's double saw bench, 26-inch single-surface planer, 10-inch moulder, hollow chisel mortiser, and a cross-cut saw and gaining machine.

At the north end of the building is the paint shop and inspection room. The space set aside for this work has a floor area of 120 x 90 feet. There are six tracks extending across this room and a portion of the floor has been sloped near one track for draining the water from car washing.

SHOP PRACTICE OF PAINTERS.

BY L. A. VAN ARNAM, MASTER PAINTER, MICHIGAN UNITED RAILWAYS.

All painters do not attain their results in the same way, but determine on the particular methods used after long experience, which is the best teacher in this as in any trade. The reason why a street car does not always look well is because of the severe service which it must perform in all kinds of weather. A car unlike a wagon cannot be cleaned every time it takes a trip. It only gets into the shop about once in nine or ten months, so the painter must do the best he can and use stock that will stand wear and weather as well as possible. Many jobs of painting must be hurried as the cars are needed in the regular schedules. Especially is this so after a wreck, at a time when the full complement of rolling stock is needed. At such times the painter must use his judgment. If the damaged car has just been painted he finishes the new woodwork in good shape; if the car needs repainting soon he will do a temporary job as he knows it will be back in the shop in a short time.

I have learned by experience that in order to obtain good results the work must be started right. All imperfections in the ground work will show in the finish, therefore, one must take pains and not slight the foundation coats. Any attempt to save money by hurrying the first coats will not pay, because it takes a certain amount of time for each coat to dry properly, and if the undercoats are not thoroughly dry and hard before the finish is put on the paint will soon be full of cracks.

The number of coats of paint required depends on the condition of the car. In some cases the old paint should all be removed, while in others it should be sanded down and the finish applied over the old paint. A good painter will have the whole job planned in his mind as soon as he has inspected the car, and will be able to tell just what he will do on each coat, how it will look and where he can cheapen, if necessary, without impairing the finish. In most cases a car should have eight or nine coats of good stock and should be revarnished every nine or ten months with one or two coats. Some painters leave off some of the undercoats. I think it is best to use as few coats as are required to get a good surface, but not to leave off any of the finish coats, as the varnish protects the undercoats and receives most of the wear. Two or three coats of varnish at the least should be used. Most painters have given up the use of rubbing varnish on the outside of cars. One coat of finishing varnish is equal in wear to two coats of rubbing varnish. It is now customary to use two or three coats of lead and three or four coats of surface. The sand surfaces are being generally used now as they save four or five days' time. The varnish primer has been found to dry harder and more quickly than the oil primer.

The inside of cars is often neglected as it is not exposed to the weather like the outside, but it is more closely observed by the passengers and should be occasionally cleaned and revarnished. In revarnishing the painter often has trouble because of the grease used by the car-cleaners, which makes the varnish crawl. But I have found that if the car is thoroughly cleaned with ammonia and water to remove the grease and dirt before applying the varnish, the best results may be obtained.

It is most important to use good stock. Cheap varnishes will not work well and will crack, flake and scale off. A good varnish will flow easily and is easy to work. Varnish should be used at a temperature of 70 to 80 degrees and should not be tampered with in any way. If the air is too cold when the varnish is applied, or if turpentine or japan is used too freely, the luster will be flat. I have used a great many paints but have never found anything better for a foundation than good white lead and pure linseed oil. These can be used in any climate with good results.

For making cars look neat and clean a great deal depends on the colors. Light yellows are good for such work and always wear well. The Michigan United Railways Company has adopted orange and lemon colors as its standards.

Painters are often greatly handicapped by being obliged to work with cheap stock. I have used what was called white lead which did not contain an ounce of lead to the ton. Good lead is expensive, but is the cheapest in the end. The shop facilities provided have a great deal to do with the quality of the painter's work. In order to do good work a painter must have a good, clean, warm, well-lighted shop. It is not always the largest road that has the best and most convenient shop. Many shops are cold and dirty, but the most common fault is poor light. Some roads have no shop at all and the painting must be done in the barns. Some managements fail to appreciate the conditions required for good paint-shop work. They will provide poor facilities and cheap stock and ask for quick work, and then when the work does not last they blame the painter. As ever, the desire is to make the work look its best with the least expense. As the larger part of the expense is for labor instead of for material many cars are turned out after 7 days' work, whereas, 10 or 12 days' time in the shop would insure a much better job.

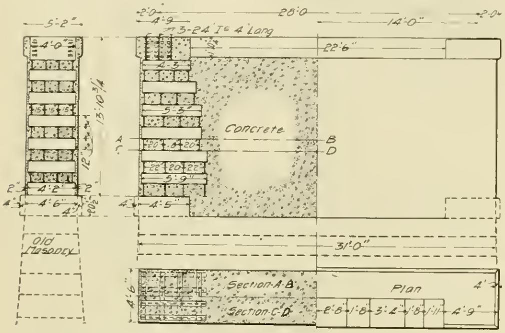
CONCRETE WITHOUT WATER.

While as a general principle the best is none too good, there are instances where a modification is justifiable. This is illustrated by the Indianapolis Traction & Terminal Company, which has made a most interesting experiment in track substructure and demonstrated the practicability of makeshift method that will be advantageous for emergency construction on city lines where it is desirable not to interrupt traffic. In June, 1905, it was desired to improve a portion of Northwest avenue, but the company did not wish to remove the old rails because they were not yet worn out, nor did the expense of putting the standard concrete substructure under track with old rails seem justified. Under these circumstances the engineer decided to ballast the track with a dry concrete mixture, using the cheapest cement to be had. Accordingly the roadway was excavated and the track lowered to a depth that would permit six inches of ballast under the ties when again brought up to grade. The ballast used consisted of 1 part natural cement, 2½ parts sand and 5 parts gravel, mixed dry at the gravel pit, the only moisture in the mixture being that contained in the sand and gravel when taken from the pits. This dry concrete was dumped on the track and tamped under the ties until the track was brought up to the proper grade. This permitted operation of cars during the work, and the track so treated has held its surface and alignment. A careful inspection of this work made in May, 1906, showed that the ballast had absorbed the moisture and had hardened, and that the concrete had about 75 per cent of the strength to be expected had it been properly mixed.

This experience of the Indianapolis company has been of considerable value to one of the interurban lines running out of the city. One of the smaller towns on the latter was improving its streets and to comply with the original specifications would have required the interurban company to build temporary tracks through the town or suspend traffic. The difficulty was avoided by the town permitting the use of dry-mixed concrete as ballast, which was done after inspection of the 2½ miles (1¼ miles double track) of track in Indianapolis, which has been described.

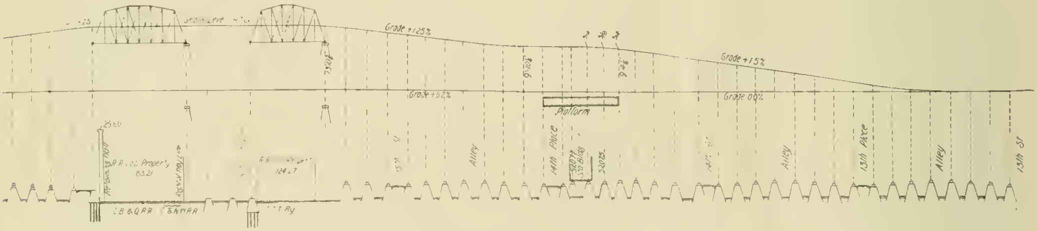
SUPERELEVATION OF TRACKS AND BRIDGES.—METROPOLITAN WEST SIDE ELEVATED RAILWAY.

In 1902 the city council of Chicago passed an ordinance requiring the elevation of the tracks of the Chicago Burlington & Quincy and Chicago & Northwestern railway companies, which are located parallel to and just north of Sixteenth street. The structure of the Douglas Park branch of the Metropolitan West Side Elevated Railway, which follows an alley between Wood and Paulina streets, crosses these tracks and their elevation made it necessary to also raise the tracks of the elevated road. Work was undertaken early this year and has recently been completed. The total length of the track which required raising was 3,071 lineal feet and the total amount of elevation in this distance was 561 bent feet. There was a pin span 203 feet long of an approximate weight of 630 tons over the railroad tracks which were to be elevated and a similar structure 156 feet long weighing about 496 tons over the tracks of the Chicago Terminal Transfer Railway. These and the entire length of the elevation were handled without material interruption to traffic.



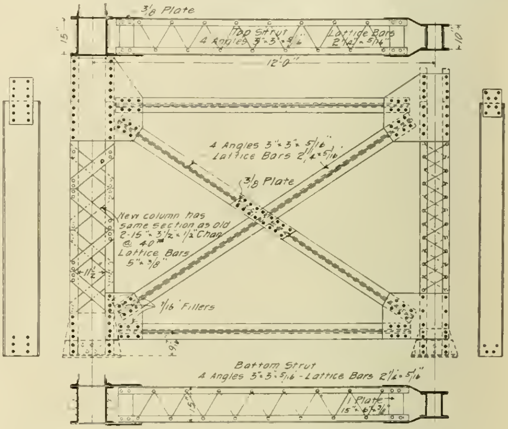
Superelevation of Tracks and Bridges—Metropolitan West Side Elevated—Plan of Addition to Stone Piers.

The location of the elevated structure in a little-used alley made it possible for the most part to employ masonry piers without material addition to the original steel to obtain the required elevation, but at street crossings to prevent obstruction, at stations and in connection with the rocker bents of the pin spans it was necessary to carry the steel downward. This arrangement of the work made it convenient to award contracts for the various classes of construction to different parties, B. H. Litcher & Co., of Chicago, securing the contract for the masonry, which amounted to about 1,200 cubic yards of concrete; the Kelly-Atkinson Construction Company, Chicago, performing the work of raising the structure and building; the Hansell-Elcock Company of Chicago, furnishing and assembling the 140 tons of new steel. The contractors worked in perfect harmony and no difficulty was encountered in carrying the work forward.



Superelevation of Tracks and Bridges—Metropolitan West Side Elevated—Profile of North Approach.

The elevation was begun in March, the contractors electing to commence work at the crossing of the railroad track where for a distance of about 500 feet the maximum lift of nearly 14 feet occurred. The two pin spans and the intermediate girder portion of the structure at this point were raised the required height and supported on timber cribbing in such a manner that the masonry work could be done, the tracks being temporarily brought down from the new elevation to the old on a 2.5 per cent grade, though the tracks at the two stations, one on each side of the point of extreme elevation, were maintained at a level grade for a distance of 160 feet. The final grades for the portion of the structure which was elevated are shown in an engraving from the profile.

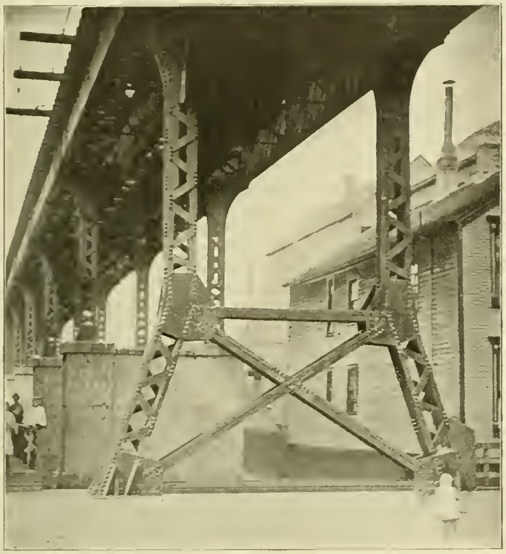


Superelevation of Tracks and Bridges—Metropolitan West Side Elevated—Details of Sub-Bent at Stations.

The jacking was done with spirit jacks, four being used at each bent and one man being employed for each jack. The average lift at each jacking was about two inches and though no train was permitted to pass the point where jacking was in progress until the structure was securely landed on the timber cribbing the average block of trains was only about three minutes. The 561 bent feet of elevation was done at the rate of 15 bent feet per day.

As soon as the elevation was completed at a bent, work on the masonry was started. The original piers of concrete were of the type common to most elevated structures, being square with a slight batter and projecting a short distance above the ground level. These were spaced 12 feet center to center at each bent and each steel support was anchored to its pier with four 1½-inch anchor rods. In the elevation the two piers were made an integral piece of masonry, the resulting form being shown in an accompanying engraving from a photograph. Short pieces of circular rods were used to tie the new intermediate masonry to the upward extensions of the original piers, the increased base and weight of the resulting pier requiring no change in the foundations. The original anchor rods were continued upward with the masonry by fastening to them a new rod of the same diameter and required length, a form of forging being employed which determined the position and alignment of the bolts without making the nature of the connection in any way similar in effect to a weld.

At one end of each of the pin spans stone piers were located and it was found that the top of these was no wider than was consistent for the bridge shoes. Accordingly the upward extension of these piers had to be made without any batter and the manner in which this was done and a thoroughly substantial piece of masonry obtained is indicated in an accompanying engraving from the engineer's drawing.



Superelevation of Tracks and Bridges—Metropolitan West Side Elevated—Concrete Piers and Steel Sub-Bent.

In the steel work three types of sub-bents were used where it was impossible to carry the masonry upward. At the street crossing and other points where the elevation approached the maximum of 14 feet a sub-bent with a diagonal bracing and a batter of 1 in 3 on the principal members was employed, the increased width of the base effected by this form obtaining added stiffness. New piers were, of course, required, but the original square type was used. One of the bents of this character is also shown in the accompanying reproduction from a photograph. The piers at the rocker bent required no material change, the uprights of the new sub-bents being of the same general dimensions and character as the original supports.

The greatest difficulty was encountered in connection with the elevation at the stations, the braking of trains incidental to stops requiring more than ordinary stiffness. The original structure provided separate supports for the station platforms so that each bent was comprised of four uprights. In the redesign for the elevation these were embodied in a tower construction with longitudinal bracing between the track supports. The tower construction also formed the stair housing and in making designs for a thoroughly safe construction and providing for erecting the steel about the station building without dismantling it, some bothersome problems were encountered. However, it was possible to make the additions of the steel supports at the bottom except in two instances where the uprights passed through the center of the station roof. At these points it was impossible to do otherwise than add the additional height at the top.

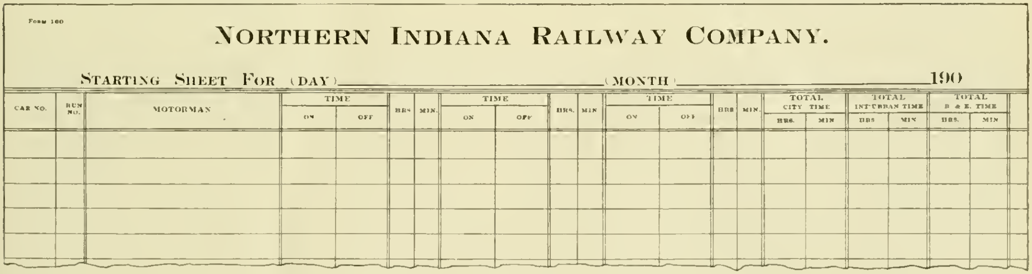
When the elevation of the entire length was completed it was found that the upper pins of the rocker bents were about two-tenths of a foot outside of a vertical plane passing through the pier centers, that is, the track had crept for that distance. This difficulty was corrected by means of the expansion joints in the steel work, which also provided for the very slight increase in distance due to the elevation.

Steel was on the ground in May and was erected soon after the work of elevation was completed. The entire work was finished early in July. Mr. B. H. Glover, superintendent of motive power and way, had general charge of the work, while Mr. H. R. Abbott supervised the details and prepared the plans.

STARTERS' RECORD SHEET.

Mr. Charles G. Lohman, superintendent of transportation of the Northern Indiana Railway Company, has recently put into use on that property a blank form, a portion of which is reproduced herewith. The original sheet, of which the illustration forms a heading, is 12½x16¾ inches in size. Such sheets are bound in block form with blank sheets of like size for every other page. There are two colors of paper used, yellow and white, the blocks made of white paper being used for keeping a record of the motormen's time and the yellow blocks for the conductors' time.

The car starters at the barns are responsible for recording the data called for by this sheet. The advantages of the use of the sheet are many; for the purpose of preparing pay rolls, to be able to know at any time where each man on the road can be reached and when filed as a valuable record for the claim department.



Form 160

NORTHERN INDIANA RAILWAY COMPANY.

STARTING SHEET FOR (DAY)________________ (MONTH)________________190

CAR NO.	RUN NO.	MOTORMAN	TIME		HRS	MIN.	TIME		HRS.	MIN	TIME		HRS	MIN.	TOTAL CITY TIME		TOTAL INTERURBAN TIME		TOTAL B & E. TIME		
			ON	OFF			ON	OFF			ON	OFF			HRS.	MIN	HRS	MIN	HRS.	MIN	

Northern Indiana Railway Company—Record Kept by Car Starters.

Two types of electric omnibuses without storage batteries are now being used in Paris, the Krieger and the De Dion. In each a gasoline engine drives the generator.

CENTRAL ELECTRIC RAILWAY ASSOCIATION.

The importance and variety of the questions coming before the state associations in the Middle West determined the Central Electric Railway Association to arrange for a secretary who should devote his entire time to the association's affairs and on March 1, 1906, this plan was made effective. The secretary, Mr. J. H. Merrill, with offices at 306 Traction Terminal Building, Indianapolis, has been active in collecting data on subjects of interest to the members and in securing joint action on many important points.

Several matters which are to be taken up at the next meeting of the association at Ft. Wayne, September 26, relate to traffic, and include joint passenger tariffs for Ohio, Indiana and Michigan electric lines; the matter of adopting standard freight classifications, rates for party cars, uniform baggage charges and the organization of a traffic association.

The association has in preparation a directory of Ohio and Indiana electric railways which will be issued at an early date.

A committee has been appointed to recommend a form to be used in reporting data on lightning arresters, with the view of getting comprehensive and exact information on this subject, and later formulating specifications. The committee includes representatives of the companies manufacturing lightning arresters and comprises:

G. W. Whysall, general manager, Columbus Delaware & Marion, Delaware, O., chairman.

H. B. Dates, head of electrical engineering department, Case School of Applied Science, Cleveland.

E. M. Hamlin, manager railway department, Lord Electric Company, Boston.

J. V. E. Titus, second vice-president, Electric Service Supplies Company, Chicago.

Oscar Carman, Indianapolis, representative Stanley-G. I. Electric Manufacturing Company.

G. B. Dusinberre, manager Cleveland offices, Westinghouse Electric and Manufacturing Company.

C. R. McKay, engineer, Cincinnati office General Electric Company.

J. E. North, electrical engineer, Indiana Columbus & Eastern Traction Company.

F. B. Matthews, chief engineer, Lake Shore Electric Railway, Norwalk, O.

C. N. Wilcoxon, general manager, Cleveland & Southwestern Traction Company, Cleveland.

W. E. Rolston, superintendent motive power, Canton-Akron Traction Company.

M. E. Baxter, master mechanic, Western Ohio Railway Company, Wapakoneta, O.

G. H. Kelsey, Indiana Union Traction Company, Anderson, Ind.

Adolph Schlesinger, electrical engineer, Indianapolis & Northwestern Traction Company, Lebanon.

G. D. Nicholl, electrical engineer, Indianapolis & Cincinnati Traction Company, Rushville, Ind.

M. J. Kehoe, chief engineer, Ft. Wayne & Wabash Valley Traction Company, Ft. Wayne, Ind.

Indiana Laws Favorable to Interurban Railways.

"Five reasons for purchasing Indiana traction bonds" are thus enumerated by a Chicago company dealing in municipal bonds:

1. In purchasing interurban bonds one is interested in the future growth and development of the line, and if the statutes permit extensions it is evident that it may reach out and expand as fast as conditions warrant. Indiana laws permit extensions and construction of trolley lines by simply securing consent of county boards, while in New York, Ohio and some other states the conditions imposed on the trolley lines in making and extending their roads are severe, and may in some instances be prohibitive, as consent of at least one-half the frontage must be secured in addition to the authority granted by the county and city officials.

2. Indiana laws permit companies to appropriate property by direct condemnation proceedings.

3. Indiana laws grant absolute right to lay out right of way three rods in width.

4. May cross all highways and other railroads on the same conditions as regulate steam roads. New York, New Jersey and Illinois state laws, on the other hand, favor steam roads to the extent of prohibiting trolleys to cross at grade. New Jersey grants trolley companies no independent power of eminent domain. Illinois limits consent to use of highways for longer term than 20 years, and New York hampers extensions of the trolley line by confining right of way to the one mentioned in articles of incorporation.

5. The fullest permission is granted in Indiana to carry freight, express and mail on trolleys without speed restrictions. No power is granted in New York, New Jersey or Illinois to trolley companies to take on these profitable side lines.

INDIANAPOLIS & CINCINNATI TRACTION COMPANY'S EXTENSIONS.

The Indianapolis & Cincinnati Traction Company in addition to the construction of extensions from Rushville to Connersville, 17½ miles, and from Shelbyville to Greensburg, 20 miles, is converting the Shelbyville division (from the city limits of Indianapolis to Shelbyville, 25 miles) for operation by single-phase instead of direct current. On the first single-phase section of the system (Indianapolis to Rushville) the poles for both high-tension and trolley lines were spaced 100 feet apart, but on the extensions and on the Shelbyville division the trolley poles are 120 feet apart and the high-tension poles 115 feet apart. The trolley wire on the Rushville division is supported from the messenger cable at intervals of 10 feet, making nine hangers between poles; of these hangers, two (one near each pole) are 5 inches long and the other seven, 3 inches long. On all the later work there are four lengths of hangers used for supporting the trolley wire. The messenger spans being 120 feet long, 11 hangers are needed and these are two of 11 inches, two of 9 inches, two of 7¾ inches and five of 6 inches, an arrangement which gives a more nearly horizontal trolley wire.

The progress of the work is as follows: On the Connersville extension the grade is complete except at Williams Creek and a considerable portion of the steel is laid; at Williams Creek is a concrete arch bridge of 50 feet span and 35 feet above the water, which is completed, but a fill of 23 feet above the bridge has yet to be made. On the Greensburg extension the grading is done, all bridges but two are in place and about one-half the track is laid. On the Shelbyville division the poles are all placed and the messenger cables and trolley wires erected for about half the distance. It is expected that the direct-current power plant now supplying current for this division will be abandoned within 60 days and the line operated from the Rushville alternating-current plant.

Test of Electric Locomotives.

The Spokane & Inland Railway has been making some tests with its new electric locomotives recently received, with the following results, as expressed by an official of the railway: "The new electric locomotives have proved most satisfactory in every way. The locomotive complete consists of two sections, but the other day we put a load of 1,080 tons on one section and hauled it from Coeur d'Alene to Spokane. On the line there is a stretch of track on a 1 per cent grade. The train consisted of 25 loaded cars, three empty ones and one dead steam engine. The run was made without a breakdown or any kind of a hitch whatever. This test is considered satisfactory, as one section is only guaranteed to haul seven cars of 60,000 pounds capacity up a 2 per cent grade at a speed of eight miles an hour. The total engine of two sections weighs 100 tons and develops 1,200 horsepower. This engine will pull more than a 115-ton steam locomotive."

The Little Rock Railway & Electric Company has decided to provide a club room for its employes at the car barns. A reading room, shower baths, lockers, etc., will be furnished.

PRIVATE VERSUS MUNICIPAL OWNERSHIP OF PUBLIC UTILITIES.*

BY FRED G. SIMMONS, SUPERINTENDENT OF CONSTRUCTION AND MAINTENANCE OF WAY, THE MILWAUKEE ELECTRIC RAILWAY & LIGHT COMPANY.

Before considering a mass of special references on the subject, a few words should be devoted to the general and fundamental natural laws involved in the question. Originally, man acquired his living by forage from his enemies and through the bounty of nature. His opportunities were limited, however, and he supplemented those things he was able to secure himself by trading with his neighbor. From this humble source was trade developed, and it was the natural course of development.

Government was originated to co-ordinate, systematize and enforce the various rules of conduct found necessary from time to time to protect both life and property. Thus government was intended to protect and foster business, and not to assume business functions itself. It was organized and intended to be an entirely impartial means of regulating and controlling business, within reasonable limits, and the minute it steps out of that particular sphere and assumes to enter the business field itself, just that soon it commences to decrease its efficiency along the lines for which it was particularly created.

The movement to foster and extend municipal ownership of public utilities (so-called) is the outgrowth of socialism in every case, but it is hardly to be conceived that the socialists themselves, even in the faintest degree, realize to what particular epoch of civilization they are proposing a reversion. Any popular movement must be expected to work out its ultimate destiny in a logical manner and to a logical conclusion. The ownership of public utilities is an elastic term and has already been interpreted in Great Britain as meaning all public necessities—and in many cases, public comforts—for the word necessity has also become of an elastic nature. The ultimate municipal ownership of all these various lines of industry would, without doubt, lead to a system of paternal control of mankind never paralleled since the Middle Ages, when the feudal system obtained. What is the difference between the feudal lord and the municipal council, which, entrenched behind an absolute power to control all favors, would be in a position to build up a following upon which it could depend to an even greater extent than the old feudal lord, who was not protected from his neighbor, as would be the modern municipal autocrats.

The discouragement of individual enterprise and energy would result, as it has resulted always under such conditions. In opposition to the present industrial conditions of many of the European nations, given over to so-called advanced ideas of municipal ownership, the growth and phenomenal prosperity of our own country are due entirely to a system against which the present agitation is aiming, a system which has always encouraged to the full individual effort and industry. What though, because of the rapidly increasing volume of business, abuses have insidiously crept in, and this is undoubtedly the case, is it not a mistake (and a childish mistake) on the part of the government to say: "We are unable to control reasonably these things and must, therefore, operate them"? Think of our governing bodies claiming that they are unable to properly govern the avenues of commerce and in the same breath proposing to take over and not only govern, but organize, operate and administer the entire commercial system. It lies within their power to properly govern public utilities and, as already stated, practically all lines of legitimate business are not only public utilities, but public necessities.

It may be desirable, however, to elect a better class of citizens generally to public office, and this is no reflection on the many able and conscientious citizens now serving the municipalities, but there are many who are not conscientious, and many, many more who are not able.

No one more than the public service corporations would appreciate the election to office of high-minded, conscientious and honest citizens, and those of that quality who do hold office are duly appreciated, but it is incumbent also that public officers be fair-minded and judicial in their treatment of all questions, and the socialist, the anarchist, the man of one idea only, is of no more value to the state than the dishonest man. It may be argued that it is impossible to elect all honest, capable and efficient officials. Such, however, would not be the case if the spasmodic and sporadic efforts that are now being made along emotional lines are directed into the proper channels and systematically carried forward. It is argued that the proper class of citizens often consider themselves too busy to undertake the unremunerative duties of municipal office, and though this is a mistake on their part, it is too often true. Do these citizens realize, however, that in municipal ownership they are proposing eventually to wipe out their own business or to so reduce it that they will then have time to assist in operating the gigantic monopoly each municipality proposes to build up for itself? Let us return to a self-evident deduction and acknowledge that not one in a hundred, no not one in a thousand, of the advocates of municipal ownership—or municipal trading as Great Britain styles it—even begins to realize the eventual outcome, and in many cases the viewpoint is so narrow that opposition to the possibly more prosperous large corporations is the entire basis on which their advocacy of municipal ownership rests. Many small merchants, grocers, butchers, bakers and others are arrayed in favor of the municipal ownership theory for the reason that at present in this country it has been applied to some of the larger corporations only. If it were proposed to operate a municipal grocery, meat market or bakery their views would undergo a rapid and rabid alteration.

It is fallaciously urged that only such lines of industry as secure their rights through public privileges are to be affected, but let me ask: "Does not the grocer's delivery wagon occupy as much space in the streets as the street car, and does it not do its share in wearing out the pavements on those streets?" All business lives through public need and by public privilege, and the government is intended to regulate and control it and not to monopolize it.

Let us also not lose sight of the fact that all regulations, laws and public control must be based absolutely upon right and justice to all concerned and one man's prosperity must not be limited and controlled by another man's lack of industry and thrift, or the whole social fabric falls. It is possible to tax and harass any industry, if not out of existence, at least into a lack of activity almost as fatal to the welfare of the whole citizen body as it is particularly fatal to that portion constituting the class which depends upon its hands and its brawn, and not upon its head. As soon as the inducement to personal activity is removed a condition of apathy ensues which has spelled oblivion for nation after nation.

People may argue that the business of ruling bodies is to accomplish the greatest good for the greatest number, and this is essentially so, but it remains to be proved that any scheme of municipal ownership yet entered into even approximates to this result. Take Germany, for instance, and while it may be claimed that, for Germany, the methods there employed are most advisable, it certainly would not do to try to govern this country in like manner. Compulsory military service and crown-protected monopolies are the very things this country was established to avoid. Americans who laud European conditions could not be induced to leave this "trust-ridden" nation where times are good, work plenty and wages the highest in the world.

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*Abstract of a paper read before the League of Wisconsin Municipalities, Ashland, Wis., August 23, 1906.

To any one who wishes data as to municipal ownership conditions in Germany I recommend an article published in the July, 1906, number of the Electric Railway Review, page 377, entitled "Municipal Ownership in Germany," by Prof. Hugo R. Meyer. This shows municipal ownership of the street railways of Germany in a very bad light from several viewpoints.

Coming over to England where municipal ownership is supposed to be at its zenith and waxing great day by day, we find the wail of the taxpayer, or, as the English term him, the ratepayer, arising at last, and in newspapers, magazines and ratepayers' organizations, a determined effort is being made to check the further progress of unreasoning and injudicious municipal trading which is now being urged on by the socialists, and is primarily the cause of the great labor depression now affecting England.

The London Times recently prepared a table showing the profits obtained by municipal trading in 32 representative English municipalities. The table also showed the amounts set aside to cover depreciation. In 21 of the 32 cases absolutely no allowance for depreciation was made, and in the other cases the largest allowance made was by the city of Birkenhead, where a little less than 1 per cent was set aside each year for 10 years.

Every one of the 32 cities through their methods of bookkeeping showed a certain amount of profit, but, if anything approaching an adequate allowance for depreciation were taken into account, the profit would not only be absorbed but a correspondingly large deficit shown.

The Right Honorable Lord Avebury, writing in the London Standard under date of November 22 and 23, 1905, discusses municipal ownership in London under the general caption, "Municipal Trading," and cites from taxation reports showing that local (municipal) expenditures in the year 1891-1892 were £76,000,000, while in the year 1901-1902 they had risen to £144,000,000, or almost double in 10 years. He also quotes figures to show that taxes had actually increased 100 per cent in the 12 years from 1891 to 1903. An equally large increase in municipal borrowing is also shown in these same articles and all this clearly traced to municipal trading, so-called.

Lord Avebury in these articles gives seven objections to municipal trading in England, and particularly in London, enumerated as follows:

1. It involves an immense increase in municipal debt.
2. As there will not be the same stimulus to economy and attention, there will be a great possibility, not to say certainty, that one of two things will happen; either there will be a loss or the service will cost more.
3. The legitimate functions and duties of our municipalities are already enough, if not more than enough, to tax all their energies, and fill up all their time.
4. In some cases the municipalities will defeat the very objects they have in view.
5. It will involve municipalities in labor disputes.
6. It involves the creation of monopolies.
7. It is a serious check to industry, invention and discovery.

He goes on to show by citing specific cases that in accounting the various municipal businesses improper charges are frequently made which tend to create a false impression as to financial success accomplished. He also shows that competing corporations are excessively taxed while the municipal business is unwarrantably favored.

Lord Avebury says: "The accounts of municipal electric undertakings for the year ended March 31, 1903, show losses in more than 60 towns in the United Kingdom. The total capital expended in regard to these towns amounts to £5,881,351 and the loss on working was £86,649. It is evident, moreover, that the accounts do not show the full loss. In comparatively few places does any sufficient sum appear to have been placed to depreciation or reserve during the year under review. At Glasgow the loss was transferred to a 'suspense account,' and in several other cases the loss was either charged to the general district or borough fund, or in part paid by this means and the balance carried forward to next year's account."

An object lesson found in these articles is the fact that the London County Council, after acquiring the tramways in the city, leased the less valuable portion which lay north of the river to a private corporation, and operated the more valuable portion, which lay south of the river, municipally. The municipal authorities naturally retained that portion they considered the best, and yet within a specified time the revenue received by the city from the private company amounted to £200,000, while the profit made by the city through the operation of its portion was only £80,000, a balance in favor of private operation of $600,000.

[Mr. Simmons then proceeded to give extracts from reports and other documents covering municipal activities in various cities, including Glasgow, Detroit, Bay City, Mich., Boston, Cleveland, Hamilton, O., Chicago, Worcester, Mass., and Ashtabula, O., the facts cited showing that the results, in service and in cost, obtained by the municipalities are inferior to those obtained under private ownership, principally for the reasons that the administration of the municipal plant is inferior and that the municipality often hampered by limitations placed upon capital expenditure. Incorrect accounting more than any other one thing, is responsible for the erroneous idea that municipal plants are successful.—Ed.]

The deductions to be drawn from my study of this subject are as follows:

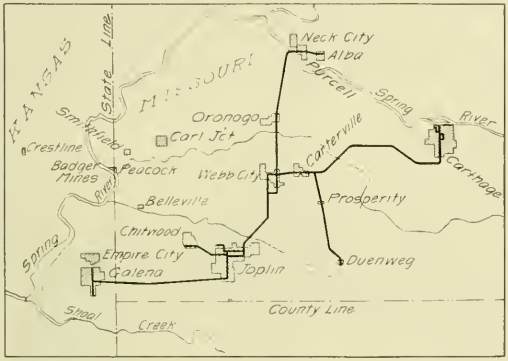
The general functions of governing bodies are reasonable and conservatively to control and regulate personal conduct, and business and commercial organizations and transactions, to care for the public domain and levy and collect as small an amount of money (as taxes) as is consistent with an efficient performance of these duties. Even though you fail to admit that the assumption of commercial functions by governing bodies is ethically wrong I believe, after a thorough review of the results obtained in the past, experience has more than demonstrated that from the standpoint of the taxpayer it has been and is a gigantic and continuing mistake. I believe that prejudice is being allowed to take the place of calm and deliberate judgment and that an inherent human desire on the part of those who, through lack of ability or lack of opportunity, are in poor or moderate circumstances, to pull down those who have prospered is being worked on and encouraged by the socialistic and anarchistic element. I am convinced that if any fair-minded citizen will take the time to study thoroughly the subject he will be forced to acknowledge that efforts to better business and commercial conditions are being misdirected when the municipality enters the commercial field except along the lines of reasonable and judicious regulation.

It is continually urged that there are conditions that do warrant municipal operation of some public utilities, and I presume many have in mind the water department in cities like Milwaukee, where the raw material is at hand without limit and without price, and that is undoubtedly an ideal situation in considering this question. The Milwaukee water department is furnishing water at reasonable prices and apparently doing well. There is no reason to believe, however, that a private corporation might not be organized willing to take over that business and operate it under conditions laid down by the city council in a manner at least as efficient as now obtains, and agree to sell water at an even less rate than the city is now collecting if the company were guaranteed the perpetual monopoly which the city now holds.

That some public service corporations (so-called) have abused the power and privileges vested in them to such an extent as to be to a degree accountable for the present agitation in this country in favor of municipal ownership is regrettable, and it warrants severe criticism of such an erroneous and short-sighted policy, but it also carries with it ample reason to criticise severely the governing bodies which by lax methods and equally short-sighted policies, have permitted such abuses to obtain, and certainly is no warrant for those same governing bodies to make the further mistake of going outside of their natural functions to engage in disastrous experiments along commercial lines for which not one in fifty of their members is at all fitted.

THE SOUTHWEST MISSOURI RAILROAD COMPANY.

The Southwest Missouri Railroad Company is a recent re-organization of the Southwest Missouri Electric Railway Company and the Webb City Northern Electric Railroad. The Southwest Missouri Electric Railway Company had its beginning in a mule road connecting Webb City and Carterville, Mo., built in 1889 by Mr. A. H. Rogers, now president of the Southwest Missouri Railroad Company, and was built in 1894 as an electric road from Joplin via Webb City and Carterville to Prosperity. In 1896 the Jasper County Electric Railroad and the Joplin & Galena Electric Railway extending from Joplin, Mo., to Galena, Kan., were purchased. In 1903 extensions were built from Prosperity to Duenweg, from Joplin to Smelter Hill, in West Joplin, and from Joplin to Chitwood. During the present year a new line was built by the Webb City Northern Electric Railroad Company, a subsidiary corporation of the Southwest Missouri company, from Webb City to Oronogo, Neck City, Purcell and Alba.



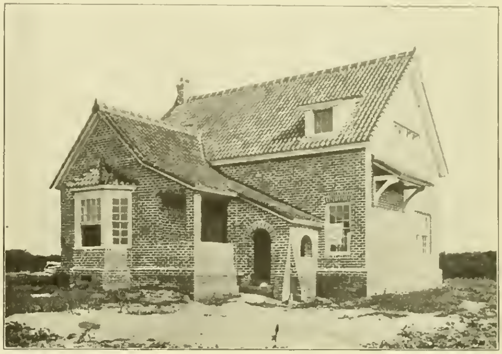
Southwest Missouri Railroad—Map Showing Routes.

On August 16, 1906, the Southwest Missouri Railroad Company was incorporated under the railroad laws of Missouri for the purpose of taking over the Southwest Missouri Electric Railway Company and the Webb City Northern Electric Railroad Company, with increased powers, and for the purpose of providing increased capital for important and substantial extensions and enlargements of the absorbed companies. The re-incorporation involves no change of ownership of the road and the same officials are retained who have been at the head of the company from the start. Under the laws of Missouri a street railway company can not condemn land, but since its incorporation under the general railroad law the company has this privilege.

Financial.

The Southwest Missouri Railroad Company is capitalized at $5,000,000, of which $3,500,000 has been issued. The new company has assumed the bonded debt of the Electric Railway Company, $1,150,000, and the funded debt of the Webb City Northern, $200,000, and has set aside $1,350,000 of its own bonds for the purpose of redeeming the bonds of its constituent companies. The new company has also issued its bonds to the extent of $550,000 in payment for the equity of the old companies and has $3,100,000 of bonds in reserve to be issued only for future improvements and extensions under restrictions. The total authorized bond issue is for $5,000,000 at 5 per cent, of which $1,900,000 is outstanding September 1, 1906, as stated.

The rapidity of the company's growth since its inception in 1893, and an idea of the extent of its business can best be seen in the accompanying statement of operations of the Southwest Missouri Electric Railway Company.



Southwest Missouri Railroad—Substation North of Oronogo.

STATEMENT OF OPERATIONS
SOUTHWEST MISSOURI ELECTRIC RAILWAY COMPANY.

Year End. Aug. 31.	Miles in Operat'n.	Gross Earnings.	Operating Expenses.	Fixed Charges.	Surplus.
1894	10	$ 35,080	$ 19,162	$ 11,078	$ 4,909
1895	10	42,438	23,794	12,819	5,824
1896	15	58,170	31,552	15,989	10,629
1897	32	117,128	62,873	28,333	25,922
1898	33	115,050	71,930	30,000	13,120
1899	33	166,377	91,509	30,566	44,302
1900	41	213,865	124 461	35,250	54,154
1901	41	203,630	122,394	45,750	35,486
1902	41	206,799	124,356	46,963	35,480
1903	44	230,768	132,433	48,000	50,335
1904	47	267,115	168,976	57,300	40,839
1905	47	317,813	173,390	53,301	91,122
1906	58	423,800	206,140	57,673	159,987

At present the company operates about 58 miles of line. The main line runs from Galena, Kan., to Carthage, Mo., 28 miles, passing through Joplin, Webb City and Carterville. Branches extend from Joplin to Chitwood, from Webb City to Alba, and from Carterville to Duenweg. During the past year several extensive improvements have been made and more are planned for the imme-

Southwest Missouri Railroad—Waiting Station, Oronogo.

diate future. Owing to the recent developments in the zinc and lead mines in this region the traffic to be handled has increased more rapidly than the ability of the company to take care of it, and warrants the use of a much more expensive style of construction and equipment than was deemed necessary when the road was built. Under the supervision of Mr. E. J. Pratt, the company's electrical and mechanical engineer, who has held that position since the company was organized, all new work is being done in a thorough and permanent manner, and the most up-to-date standards of material are being adopted.

The work of improvement now being completed is confined to that section of the main line between Joplin and Lakeside Park. Next the section between Lakeside Park and Carthage will be vastly improved, the line now ending at Duenweg will be extended on to Joplin, and new lines will be built to connect the present system with Carl Junction, Mo., Baxter Springs, Kan., and Columbus, Kan., at which last named placed connection will be made with the electric railway now being built into that city from Pittsburg, Kan., by the Pittsburg Railway & Light Company.

Traffic.

The road serves a population of 100,000 in the towns directly reached, including the mining towns of Galena, with a population of 8,000; Joplin, with 35,000; Webb City, 14,000; Carterville, 6,000; Carthage, 12,000; Prosperity, 2,500; Duenweg, 2,500; Oronogo, 3,000; Purcell, 1,500; Neck City, 2,000, and Alba, 2,500.

The entire territory traversed is thickly studded with lead and zinc mines, employing several thousand men at good wages, and is built up almost continuously between towns. The St. Louis & San Francisco and the Missouri Pacific railroads adequately handle the freight traffic of this region, but for passenger traffic these towns offer an exceptionally favorable field for an interurban line giving a frequent service. At present cars are operated on a half-hour schedule, but the traffic has already reached such proportions that the cars are filled at nearly all hours of the day and at the rush hours of the morning and evening when the miners are going to or returning from work it is necessary to run two and three-car trains and frequent trippers. Two large baseball parks located on the line of the road at Joplin and Webb City offer, during the summer, a large addition to the regular traffic between the towns. The company owns Lakeside Park with about 80 acres of ground on the line between Carterville and Carthage, which contains a theatre seating 1,600, a band stand, and boating and picnic facilities, but on account of inability to handle the increased business no effort has been made as yet to attract traffic to the park, and it is not in active operation. Next year the company expects to add the usual amusement park features and make the place an up-to-date resort.

Cars are run from each end of the line on a half-hour schedule with meeting points every 15 minutes. The schedule time from Carthage to Joplin, 20 miles, is 1 hour and 10 minutes, and the run is often made in one hour. Forty-five minutes are allowed from Joplin to Galena, eight miles, because of the necessary low speed while passing through Joplin.

The rate of fare is approximately 1½ cents per mile, the rate from Carthage to Galena, 28 miles, being 40 cents. Booklets containing 100 five-cent fare coupons are on sale at various places, such as drug stores. Convenient waiting stations are provided at various points along the line. The recently completed station at Oronogo, on the Webb City Northern branch, occupies a ground space of 14x42 feet, one end being used as a waiting room and the other end for the sale of refreshments. This building is constructed of vitrified paving brick with moss-green tile roofing and as may be seen from the engraving, presents a very handsome exterior.

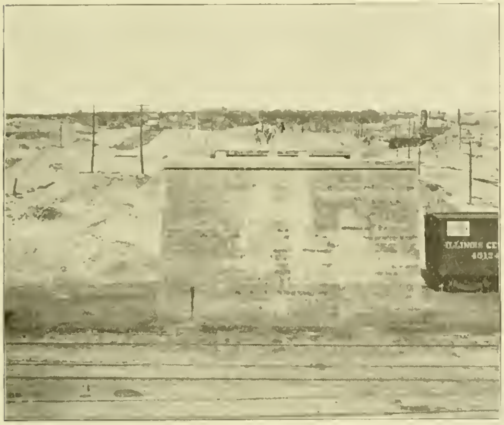
Up to the present time no effort has been made to develop a freight business, although the company expects to turn its attention in that direction some time in the near future. A small amount of express, such as parcels, hand baggage and trunks is carried on the platforms of the cars.

Southwest Missouri Railroad—Steel Viaduct over St. Louis & San Francisco Railroad.

Extensions and Improvements.

The Webb City Northern Electric Railroad, running northeast from Webb City to Alba, 11 miles, has been put in operation throughout its entire length only during the past month. This branch serves a prosperous mining community and already enjoys a good traffic. The road was built for high speed and is laid with 70-pound rails. Only one grade crossing with a steam road occurs, this being at Purcell. The maximum grade is 2¼ per cent except on the approaches to bridges and viaducts, where the grade is as high as 4 per cent. Except on viaducts and heavy grades the tracks have been laid at one side of the right of way, to provide for laying a double track at some future time.

The grading and other work on this line is of a very heavy character throughout. Several deep cuts were made through almost solid rock and a large proportion of the road is in fill. The material for enbankments, as well as the ballast, consists of crushed rock, the tailings from the mines nearby, which can be secured without expense except for hauling. Three heavy steel bridges were necessary. That over Center Creek is supported by concrete piers and is approached on the south by a long levee, broken at one point to cross a spur of the Missouri Pacific. At Oronogo Junction the main and side tracks of the St. Louis & San Francisco are crossed by a 600-foot steel viaduct, the total length of bridge and trestles being 1,550 feet. Beyond this point the tracks are carried over the Spring river by a long steel bridge with approaches over half a mile in length. Very heavy grading on the approaches was required at this point because the Spring river at times is swollen far above its normal banks and the bridge had to be built very high. The concrete abutments for these bridges are of the wing type. The manner of protecting the embankments against sliding by rip-rap work is shown in the illustration, as well as the method of inserting the poles in the embankment in the usual manner, instead of fastening them to the steel work.



Southwest Missouri Railroad—Webb City-Carterville Cut-off and Viaduct.

The new substation for the Webb City Northern, located north of Oronogo, is illustrated herewith. It is of the same substantial style of construction as the Oronogo waiting station, of vitrified paving brick set in hydraulic cement, with a moss-green tiled roof. Only the front portion of the building is used for the substation apparatus, the rear part, containing five rooms, being occupied by the attendant and his family. The grounds around the building are to be improved and well kept up.

On the main line of the Southwest Missouri about nine miles of double tracking has been completed during the present year beween Joplin and Webb City. Since the traffic has reached such proportions as to be difficult to handle with a half-hour service, and because it is considered that trains cannot be operated on a single track with much greater frequency than this, it was determined to double track the entire main line from Joplin to Lakeside Park, a distance of 12 miles. The work is well under way and considerable second track is now in operation. Grading is nearly completed over the entire distance and work is progressing as fast as labor can be secured. This work involves some heavy grading and in some places the old line is to be regraded. South of Oakland a single-track wooden bridge is to replaced by a double-track, plate-girder bridge, and when the work now on hand is completed the long wooden viaduct over the tracks of the Kansas City Southern at Joplin is to be replaced by a 1,300-foot double-track steel viaduct with concrete substructure. When the double tracking is completed a 10-minute service between Joplin and Webb City will be installed.

The heaviest work on the entire road is now being completed between Webb City and Lakeside Park, where practically the whole route will be changed to avoid a wide detour and allow for high speed. Between Webb City and Carterville alone the work involves more handling of earth than was necessary for the original construction of the whole line. The line has been relocated considerably north of the present roadway and the tracks will be carried from Webb City to Carterville on a long viaduct containing half a mile of bridges and fill and involving 90,000 cubic yards of embankment. Three double-track steel bridges, now being built by the Midland Bridge Company, of Kansas City, respectively 160, 185 and 90 feet long, will carry the tracks over the right of way of the St. Louis & San Francisco and Missouri Pacific Railroads and Buck's Branch, a small stream. The piers and abutments for the bridges are of concrete, the abutments being of the wing type. This cut-off will reduce the length of the line between the towns from 4,612 feet to 3,660 feet, and will avoid a sharp curve as well as ten grade crossings. The embankment for this viaduct, as on nearly the whole road, consists of chatts from the mines. The base of the embankment will be protected by rip-rap. The grading and concrete work is now completed and track will be laid as soon as the bridges arrive.

Between Carterville and Lakeside Park a new cut-off is being graded which will reduce the distance from 6,461 feet to 4,900 feet. This work, like that between Webb City and Carterville, involves some very heavy construction. The old grade followed the course of a ravine because it was not considered worth while to go to the expense of grading down the hill south of Lakeside Park. The illustrations show the character of the grading on this line. The Carterville-Lakeside Park cut-off involves 40,000 cubic yards of fill and the same amount of excavation, a large per cent of the excavation being through solid rock. Two concrete arches have been built on this line, one 12 feet and one 6 feet in length. The filling at the Carterville end of the line is now completed ready for tracklaying and the work of excavation near Lakeside Park is progressing as fast as labor can be secured. It is very difficult to obtain laborers in this section of the country and the work has been considerably delayed. It is now confidently expected that the entire double-track line through Joplin and from Joplin

Southwest Missouri Railroad—Rock Cut, Webb City Northern Branch.

to Lakeside Park will be ready for operation before January 1. The improvements between Joplin and Lakeside Park will cost approximatly $300,000, the cut-offs costing $100,000. All of the grading and concrete work on the line is being done by the Joplin Construction Company. During 1907 the company plans to straighten the line between Lakeside Park and Carthage in several places to avoid some sharp curves. At one point it was necessary to cross a track of the Missouri Pacific and as only a right-angle crossing was allowed the electric road had to make two sharp curves. Next year it is intended to build an overhead crossing at this point. Since the company has secured the privilege of condemning land the work of obtaining a better line will be considerably facilitated.

Track Construction.

Except in cities and towns the line is built entirely upon private right of way, 50 feet wide the greater part of the distance, but as wide as 200 feet where very heavy grading was necessary. The maximum grade is 4 per cent, with an average of 2 per cent. Most of the track has been located at one side of the right of way to allow for the construction of a second track. All new track is laid with 70-pound Cambria steel T-rails in 33-foot lengths resting on standard 6x8-inch x 8-foot oak ties, spaced 2 feet center to center. The rails are bonded with straight, outside soldered bonds with No. 0000 copper wire cross-bonds every eighth rail. The old line is laid with 48 and 60-pound rails about evenly divided. The entire line except in towns, is ballasted with crushed rock to a depth of three to four inches underneath the ties. The right of way is enclosed by barbed wire fencing. Cattle guards are of the slat type. Nearly all of the water-passes on the line are of concrete.

Power Houses and Substations.

Current is supplied from the power house located at Webb City, nearly in the center of the line. This building, which was built in 1893 according to specifications prepared by Mr. E. J. Pratt, and was erected under his supervision, is a brick structure occupying a ground space 160x96 feet. It was planned to make it sufficiently large to accommodate future additions of power machinery and is roomy and well lighted. The floors are of concrete and the roof is supported by steel trusses. The building is considered fireproof and no insurance is carried on it.

The power unit which supplies current for the ordinary load, and which is operated from 18 to 20 hours a day, consists of a 30 and 60x48-inch Allis-Chalmers cross-compound engine, operating at 94 revolutions per minute, with a capacity of 1,500 to 1,800 horse-power, having on its shaft the revolving field of a 1,000-kilowatt, 25-cycle, three-phase 11,000-volt, Stanley Electric Company alternating current generator. For periods of exceptionally heavy load or in case of an accident to the principal unit, an auxiliary unit is employed. This consists of a Cooper tandem-compound engine, operating at 94 revolutions per minute, direct connected to a 750-kilowatt, 25-cycle, three-phase, 11,000-volt, revolving-field, General Electric alternating generator. Excitation is effected by a General Electric induction motor connected to a Northern Electric Company 40-kilowatt, 125-volt exciter generator. The engine room also contains the old direct-current machinery which was originally used.

The boiler room, located at the rear of the building, contains a battery of seven double-deck Cahall water-tube boilers, of which two were added during the present year. Five boilers are in constant use and two are kept in reserve. The boilers are equipped with stokers, which are not used at present, as the boilers are fired by natural gas-burning apparatus installed within the present year. There is also an auxiliary oil-burning apparatus and a supply of 16,000 gallons of oil is kept on hand ready for immediate use on any boiler in case of a failure of the gas. The gas-burning installation is considered a great economy as natural gas is delivered at a cost of 10 cents per thousand cubic feet, and 19,000 cubic feet are equal to one ton of coal at $2.20 per ton. Forty-two cubic feet of gas per horsepower are used. The company contemplates installing in the near future a new gas engine of 2,000 horsepower capacity.

Southwest Missouri Railroad—Center Creek Crossing, Webb City Northern Branch.

The supply of boiler feed-water is drawn directly from the city mains. Exhaust steam from the main engines is condensed in an equipment which includes a Warren Steam Pump Company condenser and a Worthington steam pump. The circulation water is cooled in two 17½x34-foot "Admiralty" type cooling towers erected outside of the building.

Owing to the great frequency and severity of the electric storms in this region it was necessary to provide an especially complete system of protection against lightning. The best types of Westinghouse and General Electric arresters are used in the power house and substations.

Three 11,000-400-volt oil-cooled transformers with reactance coils are installed in the power house and the same number in each substation.

There are five substations on the line, at Galena, Joplin, Lakeside Park, Carthage and Oronogo. The two recently completed substations at Lakeside Park and at Oronogo are of brick; the others are of wood. The equipment of each is of General Electric manufacture and consists of a 250-kilowatt, 25-cycle, 600-volt rotary converter, 11,000-400-volt step-down transformers, lightning arresters and switchboards. The power house also contains a complete rotary outfit similar to that in the substations, but of 100-kilowatt capacity.

Transmission Line and Overhead Construction.

Three-phase alternating current is generated at the power house at a pressure of 11,000 volts and is transmitted to the substations through a three-wire transmission line composed of No. 4 and No. 6 hard-drawn copper wires. Locke insulators with porcelain base and steel pins are used throughout. At the substations the three-phase, 11,000-volt current is converted to direct current at an operating pressure of 600 volts. The feeders supplying the low-tension line are No. 0000 copper wires. All substations are connected in parallel with this feeder. The trolley is No. 00 copper wire, except on the older portions of the line where some No. 000 and No. 0000 is used. No. 00 is being adopted as the standard and is used in all new work. Span-wire construction is used on all portions of the line. Fifteen-inch soldered clinch ears and West End hangers are used throughout. On all new construction and in all repair work a ball strain insulator is placed on the span wire on each side of the trolley wire. For all ordinary work 35-foot poles of northern or Idaho cedar, with 8-inch tops, are used. These are spaced 90 feet apart and are set five feet in the ground. Telephone wires and low-tension wires are carried on a cross-arm at the top of one line of poles and the high-tension wires are carried on the other line of poles, two on a cross-arm and one on a bracket. Transposition of the telephone wires is effected at every sixth pole. On the high-tension wires one complete transposition is made between substations. The wires leading out of the substations pass through a six-inch tile and through a hole in the center of a glass plate set in the cross section of the tile. The wires are led directly to a pole set in front of the aperture so that no strain towers are required.

Operating System.

The movement of cars is directed over the telephone by a train dispatcher, whose office is located over the veranda of the company's office building at Webb City, across the street from the car barn. Turnout switches are located so that cars may be passed on the single-track line every 15 minutes, and a small telephone booth is fastened to the poles supporting the overhead wires at every meeting point. Instead of using a train sheet to keep informed of the position of each car on the road a unique arrangement invented by Mr. Pratt is used. This consists of a board on the dispatcher's desk marked off with lines showing sidings and branch lines to correspond with the tracks of the system. Holes are drilled at frequent intervals for the insertion of plugs bearing the car numbers and are arranged in two lines, the upper row of holes for plugs representing trains going west and the lower for trains going east. When an order is given to a car the plug for that car is advanced to the hole corresponding to the next reporting and meeting point. If a passing order is given a plug of different appearance is inserted in the hole corresponding to the passing point, while the plug bearing the car number is advanced to the next point from which the car will be reported. The conductors must receive orders at each meeting point unless special orders to the contrary have been given. At present cars are operated on a half-hour schedule, but when the new double tracking is completed a 10-minute service will be installed between Joplin and Webb City and a 5-minute service during the summer season between Webb City and Lakeside Park. The car motors are geared for a rated speed of 35 miles per hour with a 500-volt current; with the present 600-volt current a speed of about 40 miles per hour is possible.

Equipment.

The company owns 44 double-truck cars. All of the recently added new cars are of the company's own manufacture, and were built and designed by Mr. Pratt at the shops at Webb City under his supervision. The old cars were built by the Laclede Car Company. About 35 cars are used for regular service. The cars now being adopted as standard are 42 feet in length over all and 8 feet 7 inches wide over sills and are built from specially selected timber. Four steel I-beams extend the full length of the car, from bumper to bumper, and the body of the car rests on these beams. A channel bar forming the bumper iron is placed over the ends of the I-beams and is riveted to each of the beams by angle plates. The roof is of the canopy type. The interior of the car is finished in imitation of antique oak and is divided into a smoking compartment and a main passenger compartment. In the passenger compartment the cross-seats are of the walk-over type; in the smoking compartment the seats are of the longitudinal type, of wood finished in harmony with the general interior of the car. The cars are heated by electric heaters placed under the seats. The body is mounted on Taylor trucks placed 22 feet 5½ inches from center to center. Four G. E.-70 motors are mounted on the trucks and the General Electric type-M multiple-unit controller is used. All the cars are equipped with air brakes and arc headlights.

Southwest Missouri Railroad—Carterville-Lakeside Cut-off, Showing Fill.

Car Barns and Repair Shops.

The main car shop is located at Webb City on the opposite side of the street from the power house and the company's office. It is a brick structure 200 feet long by 147 feet deep and contains eight tracks under six of which are concrete inspection pits. The building is divided into two sections by a brick partition from front to rear, five tracks entering one part and three entering the other. In the rear and at one side of the three-track section are located the carpenter, repair and paint shops, and the armature-winding room. Here the company builds its own cars, makes its own castings and does all its own repairing. Twenty-three men are regularly employed in the shops, with extra help at various times as required.

It is intended to use the five tracks on one section for ordinary purposes and the three tracks on the other section for cars needing repairs, but until the new shops at present under construction are completed, it will be necessary to use all the tracks for ordinary service.

A new brick structure is now practically completed at Lakeside Park which occupies a ground space 90x110 feet, one end of which will be used as a substation and the other as a four-track car barn. Ground has just been broken north of Joplin for another new car barn which will have an area of 64x220 feet and will contain eight tracks. It will be of reinforced concrete construction in the Spanish mission style of architecture, which lends itself readily to the low, rambling form of building and when surmounted with a bell tower containing a mission bell, is expected to present a very pleasing exterior.

Personnel.

The officers of the Southwest Missouri Railroad Company are: A. H. Rogers, Joplin, Mo., president and treasurer; E. Z. Wallower, Harrisburg, Pa., vice-president; A. G. Knisely, Harrisburg, secretary; E. J. Pratt, engineer; S. F. Gunsalus, superintendent; C. E. Baker, roadmaster. The office of the company is at Webb City, Mo.

THE M. C. B. BRAKESHOE TESTS OF 1906.

Some very interesting figures are given in the report of the brakeshoe committee, submitted by Dr. Goss to the Master Car Builders' Association during the recent convention. The records are from shoes taken from stock, submitted by railroads for test, and the shoes tested are a fair representation of material in general use all over the country.

The test shoes were:

Plain cast iron.
Congdon—cast iron, wrought inserts.
Diamond S—cast iron, expanded steel insert.
Streeter—cast iron, white iron insert.
"U."—cast iron chilled ends.
Pittsburg—composition filling, steel shell.
Pittsburg—composition filling, malleable iron shell.

By arranging the friction record graphically one can see at a glance the relations between the different shoes and make comparison.

Fig 1 shows the records of test on cast iron wheels.

The shoes in general use on chilled wheels are plain cast iron and Congdon, and the frictional qualities of each depends upon the texture of the body metal which is unchilled iron. The latter has about four times the durability of the former and both are made with the steel back reinforcement which makes them practically indestructible during the life of the cast iron body.

Cast iron is a variable quantity with a wide range in composition which cannot well be specified to close limits. The specification for brake shoes has been placed on the line of the record made by strong, hard cast iron as representative of the metal usually run into brake shoes and as obtained from the first and last tap out of the cupola.

It would be a difficult matter to establish a chemical specification and physical requirements for brakeshoes. The Streeter and "U" shoes are types of hard shoes and together with the "S," are in the class covered by the hard cast iron shoe on which the specification has been based. The Pittsburg shoe is in a class by itself on account of its high frictional qualities—rising above the record of the soft cast iron shoe of the 1896 test.

On account of this high record, the brakeshoe committee has been instructed to consider the question of a maximum limit for the brakeshoe specification, and it is assumed that the present specification is the lowest limit.

In view of brake adjustments being largely based upon the retarding effect of the unchilled cast-iron shoe, is it wise to consider the use of a brakeshoe having a coefficient of friction nearly double that given by the shoe of every-day use and will it not cause trouble in the shape of flat or cracked wheels, to say nothing of irregular control of trains? Would it not be better to call for a modification in the frictional properties of the composition-filled shoe, because there appears to be ample retardation secured with the cast-iron-bodied shoes of everyday practice in switching and service work? In emergency stops at high speeds there may appear some merit in the shoes of high frictional qualities as compared with cast-iron shoes in freight service; but will not the cast iron wheels suffer here also? We have yet to hear of any complaints against the shoes of cast iron on the score of holding qualities, and a change in brakeshoe practice at the expense of the wheel is poor economy.

Fig. 2 shows graphically the results of brakeshoe tests on steel-tired wheels; all the shoes tested fully meeting the specified mean coefficient friction, as in Fig. 1. It will be seen that there is a wide variation in the retarding effect of the various shoes. The shoe in general use on steel-tired wheels in passenger equipment, engine truck and tenders, are the plain cast iron, the Diamond S, the "U" and the Streeter, all of which with the increase of load tend towards a common coefficient of friction at some point around 12,000 pounds. It appears also that the Pittsburg shoe with the composition filling tends to follow the general inclination and falls rapidly in frictional effect with increase in the rate of heating. Note the record of the 1905 report, shown by dotted line, also the record of the Diamond S shoe, of the 1905 brakeshoe report, and the general trend of the curves to a meeting-point at about 12,000 pounds load, a condition not uncommon in the case of high-speed brake in heavy passenger service. It does not appear advisable to revise the specification for the steel-tired wheel, at least the minimum limit, for there is an urgent call for more life to the shoes, for all kinds of service.

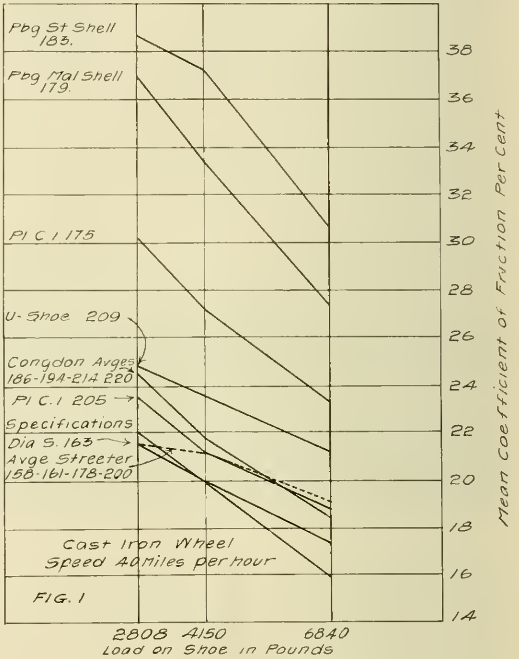


Fig. 1—The M. C. B. Brakeshoe Tests of 1906.

The improvements in brake mechanism call for stronger and more durable shoes; the first is met by the steel back, the second by harder body metal and inserts. To raise the specification would mean a possible reduction in durability

—the rejection of the hard but unchilled cast-iron shoe—while the use of an abnormally hard-holding shoe would, as before indicated, result in slid flat wheels, loose tires and the surging and break-in-two of trains.

All brakeshoe tests seem to indicate very plainly that under the extreme conditions of heat generation which obtain with the use of the high-speed brake on heavy cars the effect on all the various brakeshoes is to equalize their holding qualities. Unchilled cast iron loses its strength and grinds away more readily; hard iron and chilled take hold better; while the composition filling needs the toughness of the malleable shell, and it, too, gives way and all reduce to the same level of efficiency.

High retarding effect in the brakeshoe under conditions of low-braking load and speed of train with the present design of brake apparatus is not necessary, for the hardest shoe will be likely to slide the wheel at low speed with the emergency application. What is imperatively demanded in the brakeshoe is the highest retarding effect and ability to stand up to the effort under the maximum conditions of load, speed and consequent heat generation encountered in the application of the high-speed brake on the heavy equipment of modern passenger trains, which is well met by the cast-iron body properly protected against breakage.

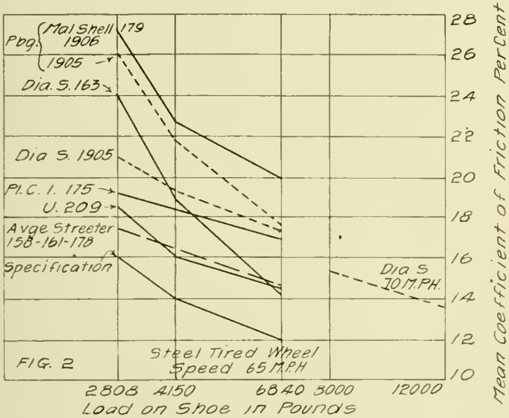


Fig. 2—The M. C. B. Brakeshoe Tests of 1906.

New Type of Trolley Wheel For the Lake Shore Electric Railway.

The Lake Shore Electric Railway Company is obtaining good results from a trolley wheel that was designed several months ago in the company's shops at Fremont, O. Since the wheel was adopted as the standard for all of the company's cars the expense for trolley wheels for this extensive interurban property has been noticeably reduced.

The new type of wheel is cast with an oval-shaped oil chamber in the web of the wheel surrounding the axle. This chamber has an extreme diameter of two inches and a maximum width of three-fourths of an inch. Provision is made, by means of a small opening in the outside surface, for filling the chamber with oil and another opening is provided for the free passage of the oil from the oil chamber to the trolley wheel axle. A one-inch spiral graphite bushing is used for a five-eighths-inch axle. When the wheel is put into the pole the oil chamber is filled with a thin graphite oil which, in ordinary cases, is sufficient to keep the bushing lubricated during the life of the wheel. The rims of the wheels used by this company are reinforced by a copper band one-eighth inch thick. It is claimed the heavy rim increases the durability of the wheel.

THE MATTOON CITY RAILWAY COMPANY.

Like many other companies owning electric railways in small cities the Mattoon City Railway Company, Mattoon, Ill., operates jointly a city and an interurban railway, an electric lighting plant and a hot-water heating system. The city railway serves the principal streets of Mattoon, and the interurban railway, known for operating purposes as the Central Illinois Traction Company, connects Mattoon and Charleston, Ill., a distance of 11 miles, and serves the main streets of Charleston. Power for all these public utilities is supplied from a main station located two blocks from the business district of Mattoon.

Track Construction and Overhead Work.

The entire length of the company's lines is 14½ miles. For 11 miles of the distance the tracks occupy a private right of way 50 feet in width, the remainder of the tracks being on city streets. The interurban line parallels the tracks of the Cleveland Cincinnati Chicago & St. Louis Railway for most of the way. The road is constructed with maximum 2½ per cent grades and 3-degree curves. At a point seven miles from Mattoon there is a bridge of two 200-foot spans over a creek, and one mile west of Charleston the tracks pass under those of the Toledo St. Louis & Western Railroad. All water-passes on the line are of concrete construction. The track is composed of 70-pound A. S. C. E. section steel rails in 30-foot lengths, laid with suspended joints on oak ties, except on the paved city streets, where 72-pound 6-inch girder rails are used. The company maintains the pavement for a width of eight feet. The interurban tracks are ballasted with gravel and cinders.

The overhead construction is of the bracket type. The figure eight No. 0000 trolley wire is strung on tubular iron brackets 18 feet above the rails, supported by 35-foot poles set five feet in the ground and 100 feet apart. A 600,000-circular mil copper feed-wire supplemented by a No. 000 copper cable is carried from the power house to a point four miles from Mattoon. The supplementary wire is required to keep up the pressure at Urban Park, where a large number of incandescent lights are used.

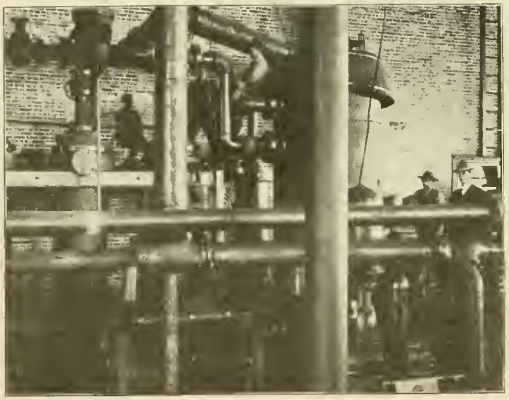
Power House.

The power station is a brick structure 70x130 feet in floor area divided by a fireproof brick wall into two main parts, the engine room occupying a floor space of 70x90 feet and the boiler room 40x70 feet. The side walls of the building are 22 feet high. The roof is of steel girder construction and is covered with a slate composition. The floor of the engine room is of concrete and that of the boiler room is of clay brick laid on edge in concrete. The boiler-room equipment consists of two Babcock & Wilcox boilers, each of 302 horsepower rated capacity, a Sterling boiler of 300 horsepower capacity and a Scotch marine boiler of 200 horsepower capacity. The latter unit is used only when one of the others is out of service. The engine room equipment consists of a 22x42-inch Corliss engine direct connected to a 325-kilowatt, 600-volt, Westinghouse generator and a Chuse engine connected by belt drive to a 150-kilowatt, 600-volt generator. The latter is a high-speed engine built by the Chuse Engine Company, of Mattoon.

Lighting and Heating Systems.

The lighting equipment consists of two General Electric generators of 250-kilowatt capacity each, two 70-kilowatt alternators and a 90-kilowatt, 220-volt machine. The latter is direct connected to a 500-volt motor and is used exclusively in carrying the day load of the lighting system.

The hot-water heating system which supplies heat for the principal public buildings of Mattoon is arranged in a pit in one corner of the engine room. It consists of seven 36-inch heaters. The exhaust is led through a 12-inch header to the heaters in which a pressure of from 40 to 50 pounds is maintained. In the heaters the steam condenses and afterwards passes into the trap and hotwell, as described later. The water is forced from the heaters into the mains, which distribute it to the customers about the city by three duplex pumps. This company, like many others supplying heat to the public, has found the project profitable so long as the heat from the exhaust steam can care for the demand. When this cannot be done and it is necessary to generate extra steam to keep up the required temperature at all points on the mains the district heating system, it is asserted, cannot be operated at a profit.



Mattoon City Railway—Piping for Heating System.

Leading from the power station are three 8-inch hot water mains. These are reduced to two 1½-inch service pipes as the buildings to be heated are entered. The return water is carried through an 8-inch pipe without pressure and is drained into the power house hot-well. The outgoing water is kept at a temperature ranging from 180 to 200 degrees Fahrenheit. A steam gauge and a thermometer are placed on each outgoing main.

The feed-water for the engines and heaters is obtained from the city water mains by means of a 2-inch service pipe. The return hot water from the heaters and the steam condensation is constantly circulated, thus reducing the quantity drawn from the service mains to a small amount. Oil and other foreign matter gathered in passing through the engines and heaters is separated from the water by means of a coke filter located in the yards at the rear of the boiler room.

On account of the large amount of water returned from the pipes of the heaters a trap of special design, sufficiently large to hold the back pressure on the heaters, was installed at the plant. This trap consists of a pipe, 10 inches in diameter, sunk in the ground to a depth of 36 feet, with the upper end elevated slightly above the ground surface. Inside of this casing a 6-inch pipe was lowered to a point 18 inches from the bottom. By means of a 5-inch pipe the hot water and steam condensation is led from the engine room to the trap, where it settles to the bottom of the larger casing and rises through the inner casing. From the trap the water is conveyed to a filter 14 feet long and 4x4 feet in area at the rear of the boiler-room, and after 4x4 feet in area at the rear of the boiler room, and after to the hot water heaters. The oil removed from the water is dipped from the surface of the filter and again utilized for lubricating purposes.

Shops and Equipment.

The car barns and repair shops occupy a brick structure adjoining the power house. The barns have a floor space 43x110 feet. Concrete pits have been built under two of the three tracks that enter the building, to facilitate repair work. The shops, located at the rear of the car barn, occupy a floor area 40x50 feet. In this building are located the lathes, drills and other machines needed for repair work.

The rolling stock equipment consists of eight cars. The city cars, made by the St. Louis Car Company, are 21 feet in length and are equipped with two Westinghouse No. 56 motors. The interurban cars were furnished by the Cincinnati Car Company. They are 47 feet 6 inches long over all and are equipped with four No. 56 motors. The company has one 45-foot express car.

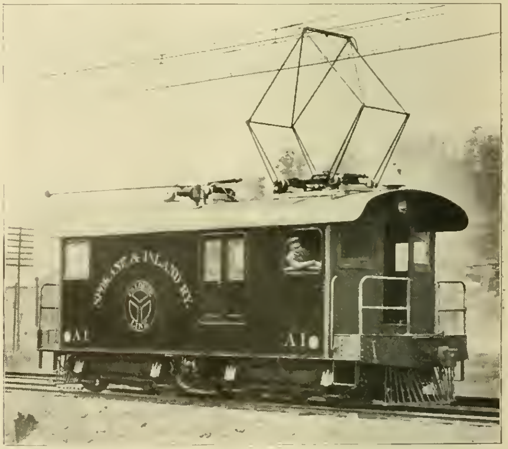
Personnel.

The Mattoon City Railway Company was organized in 1903 and began operating cars in 1904. The officers of the company are: E. A. Potter, president and general manager, Chicago; A. W. Underwood, secretary; L. C. Rose, treasurer; H. W. Tolle, general superintendent. The offices of the company are located at Mattoon.

THE SPOKANE & INLAND RAILWAY.

Some time ago announcement was made of a new single-phase railway which was projected to run between Spokane, Wash., and several neighboring cities, and since that time the general plans of the system have been completed, contracts for the equipment let, and the construction work on the first section is now finished. As this road embodies a number of entirely new features in electric railway work, an outline of some of its important characteristics will be of interest at this time.

The Spokane & Inland Railway Company was incorporated in Washington on January 10, 1905, with a capital stock of $3,500,000, the incorporators being well-known local capitalists, including Jay P. Graves, president of the Spokane Traction Company, and F. A. Blackwell, president of the Coeur d'Alene & Spokane Railway Company. The principal terminal of the road is Spokane, from which the line runs south through Waverly and Spring Valley Junction, and there branches off into two lines, both in a general southerly direction. The western branch extends south through Rosalia and Thornton to Colfax, and the eastern branch through Oakesdale, Garfield and Palouse to Moscow. The total mileage, including both branches, is 114 miles.



Spokane & Inland Railway—Electric Locomotive Using Pantagraph Trolley.

The roadway and overhead system have now been completed for operation as far as Waverly, 34 miles from Spokane. Contracts have been let and grading is now in progress from Waverly to Colfax and Moscow.

In addition to its railway business the company proposes to transmit and distribute electric current for lighting and power, both in the city of Spokane and in the towns through which its lines pass. The country traversed by this road produces large quantities of wheat and fruit and is not provided with any railroad transportation. This insures a large freight business for the new road, as the long wagon haul to the steam railroads will be avoided. For this reason the electric road is receiving the hearty support of the farming interests along its route.

There are three classes of service to be maintained—passenger, mail and express, and car-load freight. The Westinghouse single-phase, alternating-current system has been adopted. The cars of the Spokane & Inland enter Spokane over the tracks of the Spokane Traction Company, which operates a 600-volt direct-current system, and this requires the use of both direct and alternating current on the interurban cars.

Power purchased from the Washington Water Power Company is used for the operation of this road. It is delivered as 4,000-volt, three-phase current of 7,200 alternations to a frequency-changing station about 10 miles south of Spokane. This station will contain four motor-generator or frequency-changing sets, each of a normal rating of 1,000 kilowatts, consisting of a 1,000-horsepower, 60-cycle, three-phase, 4,000-volt induction motor; a 1,000-kilowatt, 25-cycle, 2,200-volt single-phase alternator of the revolving-field type and a 750-horsepower, 550-volt direct-current generator which is to float on a storage battery, acting alternately as a motor and as a generator. These three machines will be mounted upon a single bed-plate and will be provided with ample bearings. There are three exciter sets for the alternators, each consisting of a 75-horsepower, three-phase, 4,000-volt induction motor and a 50-kilowatt, direct-current generator. A 20-panel switchboard, electrically-operated oil circuit-breakers, and lightning protective apparatus complete the equipment of the frequency-changing station.

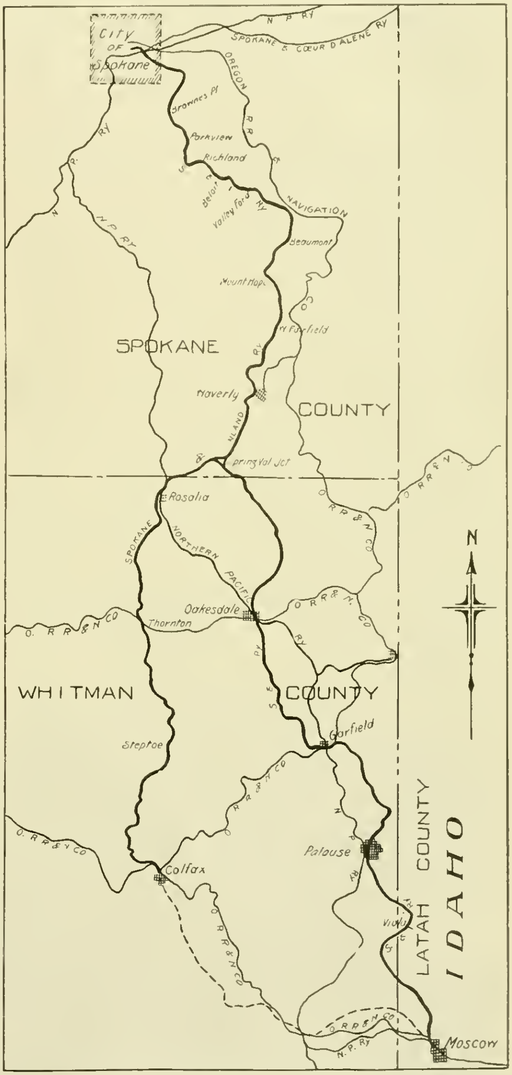
The 2,200-volt, 25-cycle current is stepped up to 45,000 volts by means of four 1,250-kilowatt, oil-insulated, water-cooled transformers, and at this pressure is transmitted to 15 static transformer substations. Each substation is equipped with two 375-kilowatt transformers of the oil-insulated, self-cooling type which step down the current from 45,000 volts to 6,600 volts, which is the trolley line voltage. The cars and locomotives operate under three different potentials: 6,600 volts alternating current in the country, 700 volts alternating current in the small towns, and 600 volts direct current in the city of Spokane.

The trolley line is of the Westinghouse standard catenary construction with a No. 000 wire carrying 6,600-volt alternating current. The high tension transmission lines are No. 2 copper wires.

The electrical equipment of both the passenger and the express cars is identical and consists of four Westinghouse 100-horsepower, alternating-current railway motors per car, which will maintain a schedule speed of from 35 to 40 miles per hour. The locomotives are equipped with the same type of motors, but the latter are each of 150 horsepower capacity. Both the motor cars and the locomotives are operated on the Westinghouse multiple-unit control system.

These locomotives are designed to handle a general carload freight business and are capable of hauling seven standard freight cars fully loaded at about 30 miles per hour on a level track. They will operate on the 6,600-volt and 700-volt alternating-current lines and on the 600-volt direct-current line. Both pantagraph and wheel trolleys are used, as shown in the accompanying illustration, the pantagraph trolley being for operation on the 6,600-volt circuit and the wheel trolley for the 700-volt alternating and the 600-volt direct-current circuits.

The cab of the locomotive serves to enclose the auxiliary apparatus and is constructed entirely of steel. The total weight of the locomotive is 49 tons and its length over bumpers is 29 feet. It has two swivel trucks with 38-inch driving wheels, and two motors are mounted on each truck and are geared to the axles. Both straight and automatic air brakes are used.



Spokane & Inland Railway—Map Showing Routes.

The preliminary order on this contract specified 15 passenger cars, 6 express cars and 6 locomotives.

The officers of the Spokane & Inland Railway Company are: Jay P. Graves, president; F. A. Blackwell, vice-president and general manager; W. G. Davidson, secretary; H. B. Ferris, treasurer; J. B. Ingersoll, assistant general manager and electrical engineer; A. M. Lupfer, chief engineer. The offices of the company are at Spokane, Wash.

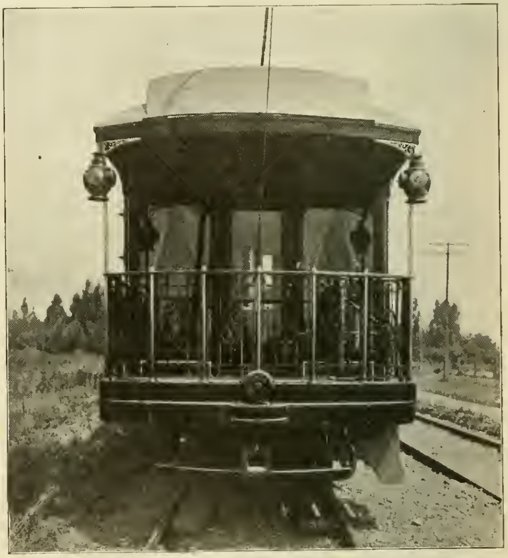
NEW PRIVATE CAR OF THE DETROIT UNITED RAILWAY.

There has just been completed in the shops of the Detroit United Railway Company an especially fine private car which will be used for business trips by the management. As shown in the illustrations, great care has been taken to provide a comfortable and artistically furnished car which will be capable of operating over any portion of the company's 700-mile system.

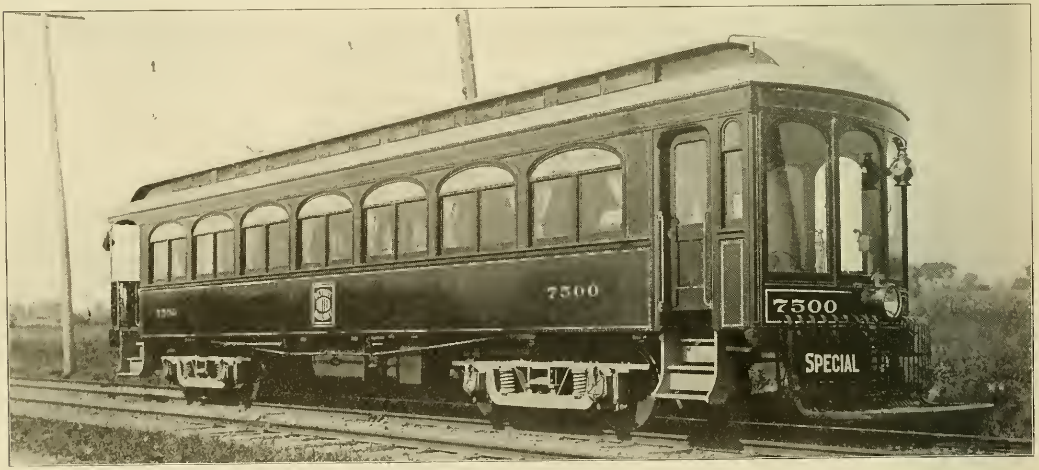
The length of the car over buffers is 52 feet and over end sills 40 feet. The width over all is 8 feet 6 inches and the height from the bottom of the end sills to the top of the roof 9 feet 4 inches.

The car body is mounted on Baldwin M. C. B. trucks placed 28 feet between centers. The car is equipped with four Westinghouse No. 121 motors with that company's pneumatically-operated, unit-control system. Steel wheels are used. The usual fittings, such as markers, fenders, etc., are of the Detroit company's standards.

The vestibules and the interior of the car have been arranged in a manner which will afford more than the usual comforts. The rear platform is 6 feet 6 inches long with steps on one side only. This end of the car is not vestibuled, but is enclosed by an ornamental bronze grill railing. Entrance to the body of the car is had through a door set in the center of the back end. The panel of this door is of plate glass reaching from the top framing to within 11 inches of the floor. That part of the rear end of the car not occupied by the door is enclosed with glass so that the view from the rear room in the car body is uninterrupted. This rear room is fitted up similar to the smoking compartment of a Pullman sleeper and is provided with standard Pullman toilet facilities. Just ahead of the observation room is a kitchen with appliances for storing food and electric stoves for cooking. In the partition between the kitchen and the observation room a space has been utilized for the storage of water and ice. Convenient to the kitchen is a closet for the storing of linen and tableware. Immediately ahead of the kitchen is an office 7 feet 9 inches long by 5 feet 5 inches wide, provided with a writing desk, a center table and chairs. This office will be used as a dining room when needed. Adjoining the office and toward the front of the car is a stateroom, of the same dimensions as the office, in which is a mahogany bedstead. Entrance to the stateroom, office and kitchen is gained by means of a 24-inch aisle which extends along one side of the car. The front portion of the car is not broken up by partitions, but is furnished as a parlor with chairs and portable tables. The front end of the car between this room and the front of the vestibule is built with the idea of furnishing an unobstructed view ahead of the car. The partition and the front of the vestibule are made of heavy plate glass extending from the roof nearly to the platform floor.



Special Car Detroit United Railway—Rear Observation Platform.



Special Car Detroit United Railway.

All the windows of the car are of clear plate glass with full curtains and window drapings. The fixtures are of polished brass and the interior compartments are lighted by clusters of electric lamps held in ornamental chandeliers and controlled by flush wall-switches, one for each room. The entire woodwork is of polished mahogany which, contrasted with the green silk window drapings, offers a very pleasing appearance. The headlinings are painted a rich green with a gold border. The floor is carpeted with a heavy dark green velvet carpet. The chairs are large, comfortable cane arm-chairs with green velvet cushions. A number of folding chairs are also carried for use on the rear platform. Electric heaters are used throughout. There is an electric fan in the office and one in the front end compartment. Brass wire screens are furnished for ventilator and side windows.

FREIGHT HANDLING ON THE TOLEDO & WESTERN RAILWAY.

No better example of the practicability of freight handling by electric railways can be desired than a recent statement of the Toledo & Western Railway Company, in which a comparative summary of the carload freight shipments handled by the company is made for the years 1904 and 1905. As shown in the statement herewith, freight to a large amount is secured for transit over the electric line. It also shows the class of goods and the number of cars loaded for shipment over the line in the two-year period. The large increase in the traffic of last year over the previous year is due almost entirely to systematic solicitation and to more rapid transit.

During the month of January, 1906, a total of 502 loaded freight cars were handled over the company's lines. This was an increase of 282 cars over the same month of the preceding year. Since then the average daily carload shipments have been far in advance of the shipments for the corresponding periods of former years.

STATEMENT OF CARLOAD FREIGHT HANDLED, TOLEDO & WESTERN RAILWAY COMPANY, 1904 AND 1905.

	Cars, 1904.	Cars, 1905.
Stone	458	725
Logs	365	261
Stock	139	555
Beets	591	720
Sugar	...	35
Hay and Straw	195	130
Grain	235	308
Lumber	206	210
Coal and Coke	337	421
Brick	53	286
Staves, Heading & Listings	149	125
Sewer Pipe and Tile	49	25
Canned Goods	17	25
Cement and Plaster	55	99
Paper	8	15
Wood	24	22
Handles	...	17
Machinery	22	96
Miscellaneous	108	140
Household Goods	21	16
Posts	24	27
Ties	...	15
Sand and Gravel	12	200
Beet Pulp	...	5
Total	3,068	4,478

The method of handling freight on this line is radically different from that used by most other freight-handling electric railways. The freight equipment consists of three 40-ton and one 50-ton electric locomotive and 75 cars of the standard box, gondola and flat types. Twenty-two stations regularly installed for the receiving and delivering of freight are maintained. At these stations stock yards are provided for the accommodation of shippers, with scales at several points.

A scheduled freight train is run daily in each direction. In leaving the barns at Sylvania the train is made up of a locomotive, a local freight car and a caboose. As it proceeds local freight is picked up and distributed, and the cars loaded for transit are set into the train line and drawn to their destination, if it is on the company's own line. If cars are consigned to foreign points they are delivered to one of the three steam roads with which the railway has physical connections. The company has pro rata agreements with 17 standard steam railroads and routes its foreign shipments over almost any line.

The accounting forms used by the freight department are identical with those used by steam railways and the rates charged for handling freight are in accordance with the interstate freight tariffs adopted by the steam railroads. It is not an unusual thing for the company to haul 15 or 18 loaded cars in a train. These trains are in charge of a conductor and motorman and two trainmen.

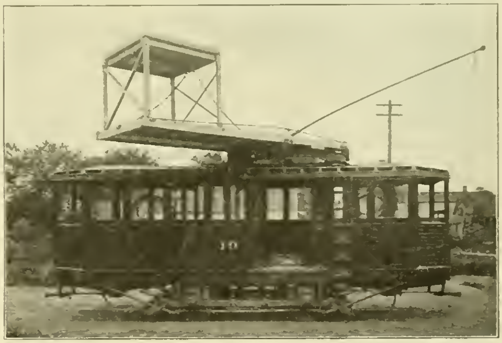
In sending its cars to foreign roads the officials of the Toledo & Western Railway Company are having some trouble with car diversion, a few of the cars still being in use on other railways after nearly a year has elapsed. To overcome this trouble as far as possible, freight shipments destined to a given point on a foreign road are loaded into cars owned by the delivering company.

The railway operated by this company comprises about 80 miles of interurban track with Toledo as the eastern, Adrian, Mich., as the northern and Pioneer, O., as the western terminal. The line passes through the richest farming section of northern Ohio and southern Michigan, from which are drawn large consignments of stock, hay, grain and other farm products. The railway also serves several mills and factories and some of the leading stone quarries of the two states in which it operates. An hourly passenger service is maintained between Toledo and Adrian and a two-hour service between Toledo and Pioneer.

In the year 1905 about 40 per cent of the total receipts of the company were derived from its freight traffic. Mr. C. F. Franklin, general manager of the road, anticipates that during the present year this percentage will be increased to 50 per cent of the total receipts.

NOVEL TYPE OF LINE CAR.

The line car shown in the accompanying engraving was built at the Omaha shops of the Omaha & Council Bluffs Street Railway Company, and is now in service on that road.



Novel Type of Line Car, Omaha & Council Bluffs Street Railway Company.

This useful piece of rolling stock was made by reinforcing the body of an old Lewis & Fowler push sweeper. The circular track supporting the swinging platform rests on four six-inch channel irons, which extend through the roof and down the sides of the car to connect with the sills. The track is made of a six-inch I-beam bent to a circle 7 feet 6 inches in diameter. One end of the 14-foot wooden platform is supported on this circle by rollers on top of the circle with wheels underneath the flange, so that it may be revolved in horizontal plane around the center of the circle, thus serving either one of two tracks. At the extreme end of the swinging platform is a smaller platform or table which can be raised to afford the workmen a standing place at a convenient height under the trolley or span wires. The interior of the entire car body is available for storing tools and line material.

REPAIRING ARMATURE COILS WITHOUT REWINDING.

In many repair shops the work of rewinding motor armatures has been brought to such a point of perfection that excellent results are obtained from local shop repairs. In most cases when an armature is sent into the shop, either on account of an interior short circuit or because of grounding, it is torn down and rewound with new coils. In many instances the coils not injured are again utilized, but it is not an uncommon thing to see an entire set of coils thrown into the junk pile and sold as scrap. Only a few armature winders have found it profitable to repair, except in emergency, disabled armatures without tearing them down.

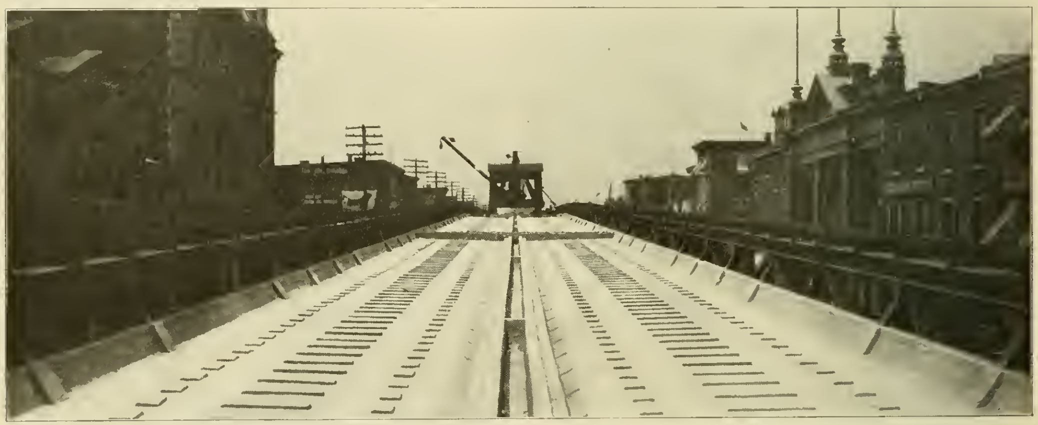
In many of the shops of the smaller companies the practice of leading the current around a defective coil by means of a "jumper" is common, but when this is done the capacity of the armature is decreased and as a result the method is not popular on the better equipped railways. Where a "jumper" is used it is seldom that the dead coil does not cause an arc or flash at the commutator, which in time brings serious results.

In the armature room of the Grand Rapids City Railway Company's shops the repairing of armature coils has been successful to a remarkable degree. The armature winders of this company have found it practicable and profitable to repair the disabled coils without tearing down the armature. The method used is simple and yet is claimed to be so effective that enough material is saved each month to more than pay for the work of maintaining the armatures in good condition. The coils repaired at the shops are said to be as durable as new ones.

When an armature is sent to the winding room either with an open or a short circuit, the outside wrappings are removed as is customary in the tearing-down process. The defective coils are then lifted from their slots and inspected. If a short circuit is found the wires are re-insulated and the coils again driven into place. If, however, the coil has been grounded, the bad section is cut out in such a manner that the leads can be used again without interfering with the connections at the commutator collar. A section of wire corresponding with the original wire of the coil is then soldered onto the leads in place of the section cut away. On the method of splicing the ends depends the success of the repairing of the coil. The ends of the wires to be joined are filed down so that the two fit together with an overlapping surface about one inch long. The ends are held together tightly and soldered. A small copper ribbon is then soldered around the joint, which prevents the connection from breaking when the coil gets hot. After the splice is made silk and insulating tape are wound around the joint and the coil is then driven into its normal position in the core. If the lower coil is the one causing trouble it is necessary to lift the upper coils from the slot to make the needed repairs. In doing this the taping of the coils is often broken, but as long as the insulation of the wires is intact the coils are not discarded.

Previous to adopting the method of splicing coils and repairing disabled armatures, five men were continuously employed in the armature room of the Grand Rapids shop. Three men now do the work for nearly double the number of motors formerly cared for. By the method used it is claimed that one man can inspect an armature and make the necessary repairs to a disabled coil in less than one day.

ELEVATED AND SUBWAY TRACK CONSTRUCTION.

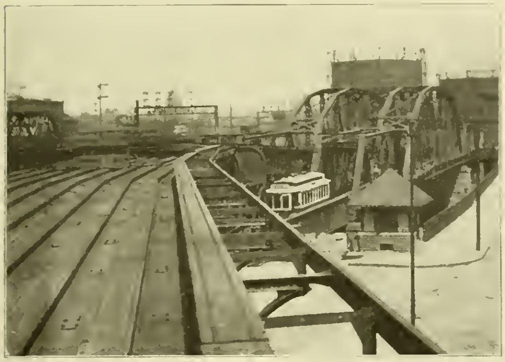

Track Construction Philadelphia Rapid Transit Company— Concrete Floor-Covering on Elevated Structure.

The accompanying illustrations show two views of the elevated division of the Philadelphia Rapid Transit Company's lines and give an excellent idea of the character of the track construction. One view shows the solid floor of the steel structure and the other is a view taken after the concrete floor covering is in place. The concrete surfacing has a slope of 3 per cent towards the center of the structure for drainage and the two outer rows of checks are to prevent the ballast from slipping laterally on the concrete base. At the point where the photograph was taken the longitudinal grade was about 2 per cent and the transverse ridges in the center are provided to prevent ballast from slipping in the direction of the track.

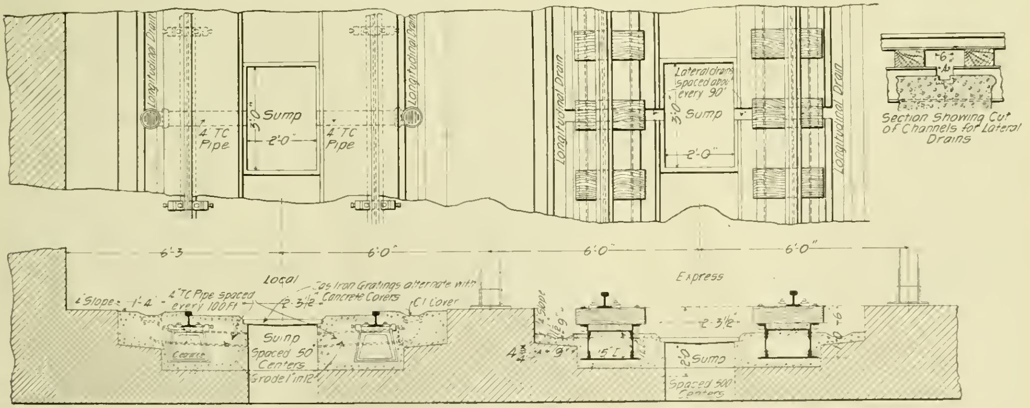
For this road the steel structure has to be exceptionally heavy because of the solid floor, the concrete covering and the heavy ballasting of the track. The solid floor including the cross floor beams weighs about 1,100 pounds per lineal foot of structure, and the ballast and concrete about 4,200 pounds per lineal foot, this being a load of 2.65 tons per foot that would not come upon a structure of the ordinary type. The weights are per foot of double-track structure.

The track construction of the subway is unique in that there is no loose ballast. The concrete foundations which are provided, as shown in the cross-section of the subway floor permit perfect draining and will enable the floor of the subway to be cleaned as thoroughly and easily as any other portion of the tunnel. This it is believed will result in improved conditions, as compared with other tunnels where loose ballast is used for the tracks, as dust and oil can be readily washed out and the disagreeable odor of the oil which would accumulate in loose ballast is eliminated.

For the express and local tracks the construction is different. For the express tracks beams are built up of channel sections. To the top flanges of the channels forming the sides there are bolted short ties (2 feet long) spaced 2 feet between centers on which the rail is laid. The rail is fastened to the tie by clips and screw spikes. The interior of the beams and the space about them is filled with concrete shaped and sloped to provide drainage channels. Sumps with openings 2x3 feet are located every 500 feet.


Track Construction Philadelphia Rapid Transit Company—Solid Steel Floor for Supporting Concrete Covering and Track.

For the local tracks there is used a chair construction similar to the company's standard in paved streets, except that T-rail instead of grooved rail is used. Cement is brought up flush to the top of the rail outside of the tracks and up to the lower surface of the head between the rails. Sumps are spaced 50 feet between centers with four-inch cast iron pipes to drain the side gutters every 100 feet.



Track Construction Philadelphia Rapid Transit Company—Plan and Cross Section of One-Half of Subway Floor Showing Express and Local Tracks.

The Strangen-Wick Railway Company, which operates a suburban line near the city of Stockholm, Sweden, has contracted with an American company for the electrical equipment for its cars. This recognition of the superiority of American electric railway apparatus is the result of an elaborate test conducted by the Swedish government about a year ago.

NEW LINE OF THE TOLEDO PORT CLINTON & LAKESIDE RAILWAY.

The Toledo Port Clinton & Lakeside Railway Company is soon to begin operating cars over its own tracks just completed on private right of way from Genoa to Toledo, a distance of 13 miles. Since the company built its railway from Marblehead to Genoa its cars have been operated jointly with the Lake Shore Electric Railway Company over the tracks of the latter company from Genoa to Toledo.

The company found it advisable to extend its own tracks on into Toledo. Though it was necessary to build over a route some longer than the one previously used, it will not be necessary to change the running time between the two terminals. The new territory served is well populated.

The new construction work was begun at Genoa. From this point the line runs parallel to the tracks of the Lake Shore Electric Railway, then leads directly north, passing successively through the towns of Clay Center, White Rock and Curtis. At Curtis the tracks again run in a westerly direction, paralleling the tracks of the Lake Erie & Western Railway and enter the city of Toledo on Starr avenue over the lines of the Toledo Railway & Light Company.

The track, roadbed and overhead construction are built according to the standard adopted by the company in the building of the balance of its property. At Clay Center an overhead crossing is made with the main line of the Lake Shore & Michigan Southern Railway. The steel span for this bridge is 104 feet in length. The approaches to the bridge are of pile and bent construction. The maximum grade on the new line is 1 per cent, except on the viaduct approaches, where a 2-per cent grade is allowed. Three 45-foot and three 20-foot concrete arch water-passes have been constructed over streams crossing the right of way. No excessive fills or deep cuts were found necessary to maintain the low grade adopted as standard.

In making the concrete arches a simple but interesting method of reinforcing the concrete was used. At periods during the progress of construction spans of woven fence wire were embedded in the concrete in sufficient number to assure its meshing and furnishing a solid mixture.

Power for the operation of cars over the new section of track is to be furnished by a substation located near the corporate limits of Toledo. A three-phase, 20,000-volt transmission line is led from the power house at Port Clinton to the rotary substation.

The Toledo Port Clinton & Lakeside Railway Company began operating cars between Toledo and Lakeside in 1904. The following year the line was extended to Marblehead and since that time a limited and a local service has been maintained over the system. The local cars cover the distance between the terminals, a distance of 53 miles, in two hours and fifteen minutes. The running time over the line by way of the new route from Genoa to Toledo will not be changed, though the distance is somewhat greater than by the old route.

THE STRANG GASOLINE-ELECTRIC CAR.

In February last the attention of the railway world was attracted by the trial trips of the Strang Gas-Electric Railway Car Company's experimental car "Ogerita," which, after a few preliminary runs on the Baltimore & Ohio and Pennsylvania lines, made the journey from Philadelphia to Kansas City with its own power and has since been in continuous operation on the Missouri & Kansas Interurban Railway.

Strang Gasoline-Electric Car "Marguerite."

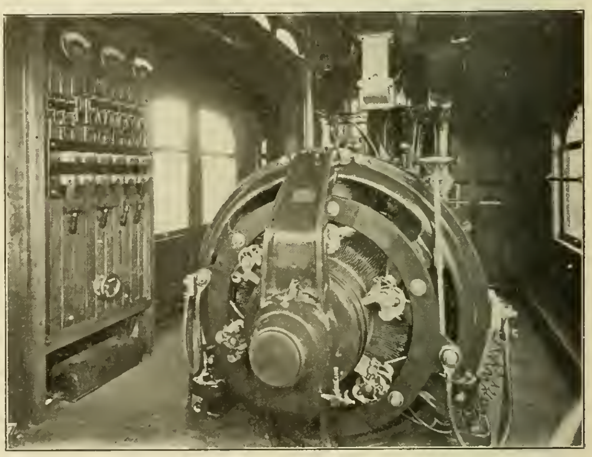
The trip of the "Ogerita" at that time was regarded as an experiment and considerable skepticism was expressed as to the feasibility of such a method of electric car operation, but after the severe tests to which the car has been subjected the manufacturers consider their claims proved, and have since had built two new similar cars for use on that road, the "Marguerite" and the "Geraldine."

The principle of the Strang system is not new; it is the same as that employed in every first-class power house, namely, the peak of the load is taken care of by a storage battery. The system is a combination gasoline engine, dynamo and storage battery. The engine furnishes power to run the dynamo, generating electricity for the motors that operate the car, and the storage battery receives the surplus power from the generator when the load is light and furnishes excess power required during acceleration and on steep grades. The system has been designed upon the understanding that, while the gas engine is the lightest in weight and least expensive to operate of power producers, it is incapable of direct application on account of the method of mechanical transmission required, while the electrical operation of cars under present methods is wasteful in power production and transmission.

What the Strang system is capable of is shown by the remarkable performance of the "Ogerita," which has traveled 18,000 miles without costing a cent for repairs, except for renewal of brake shoes. During the run to Kansas City the average speed for most of the distance was 45 miles an hour, and there was not a single mishap on the entire trip. After arriving at Kansas City, a run was made to Topeka and return. During a heavy snowstorm which was encountered the regular trains were delayed, while the "Ogerita" went through the drifts like a snow-plow, on schedule time. It was then arranged for the car to run over the Santa Fe from Kansas City to Independence and over the Burlington branch. The round trip of 550 miles was made at an average speed of 40 miles per hour, and the average speed on the round trip of 118 miles over the Burlington branch, which has grades of 3½ per cent and curves as high as 16 degrees, was 27 miles per hour. In April the car was put in regular service on a line built by Mr. W. B. Strang for operation by this system, the Missouri & Kansas Interurban Railway, between Kansas City and Olathe, Kan., a distance of 22 miles. While the road was being completed the "Ogerita" took the place of a freight locomotive, sometimes hauling as many as six freight cars loaded with steel. It is now making four trips daily between Kansas City and Lenexa, 15 miles, hauling one and two trail cars, and has never missed a trip for any cause whatever.

The two newly built cars, the "Marguerite" and the "Geraldine," have been given several trial trips and will be placed in service immediately.

The "Marguerite" left Philadelphia on August 5 for Kansas City over the tracks of the Baltimore & Ohio and Chicago & Alton, making frequent stops for inspection en route. This car is similar to the "Ogerita" and is of the combination passenger and smoker type. The car measures 52 feet 9 inches over ends and the lengths of the passenger, smoking and engine compartments are respectively, 27 feet 5 inches, 10 feet 8 inches, and 14 feet 8 inches. The engine is of the four-cylinder vertical type with 10x10-inch cylinders. The engine requires no attention while running, as the regulating apparatus is automatic, therefore one man can operate both car and engine.



Strang Gasoline-Electric Car—Engine Room.

These cars were built for the Strang Gas-Electric Railway Car Company, of New York, by the J. G. Brill Company, of Philadelphia.

The Nankai Railway, of Japan, the first railway in that country to be converted for electrical operation, has given a large order to an American company for a complete block signal installation.

RECENT ELECTRIC RAILWAY LEGAL DECISIONS.

BY J. L. ROSENBERGER, LL. B., OF THE CHICAGO BAR.

No Right to Carry Dogs—Must Answer for Damages to One Passenger from Another's Dog.

Westcott v. Seattle & Southern Railway Co. (Wash.), 84 Pac. Rep. 588. Feb. 16, 1906.

This action was brought to recover for damages to the clothing and to the sensibilities of a woman passenger, which damages were inflicted by a four-months-old puppy, brought into the car by another lady passenger, and permitted by the conductor to remain there. In affirming a judgment for such damages, the supreme court of Washington says that a street car company has no right to carry dogs upon a coach that is set apart for passengers, and if it does so, and damage is caused by said dog, it must respond to the same.

City Cannot Compel Acceptance of Transfers from Independent Company—Enforcement of Ordinance Therefor May be Enjoined in Federal Court.

Chicago City Railway Co. v. City of Chicago (U. S. C. C., Ill.), 142 Fed. Rep. 844.

A city cannot compel a street railway company, the United States circuit court, in Illinois, holds, to accept transfers from an independent company, or, in other words, it cannot compel a company to transport for nothing a man who may happen to have ridden over the lines of another independent company, even if, on the whole, it would not hurt it financially; and the enforcement of a city ordinance requiring it may be enjoined in the United States court.

Conductor not Bound to Wait for Woman to Become Seated or to Notify Her that He is About to Give Signal to Start.

Weeks v. Boston Elevated Railway Co. (Mass.), 77 N. E. Rep. 654. Mar. 2, 1906.

A woman between 58 and 60 years of age showing no sign of physical or mental infirmity having entered a car was five or six feet up the passageway when, as the evidence warranted a finding, the conductor gave the signal for the car to start, which it did suddenly, with a violent and unusual jerk, the woman being thrown over backwards upon the floor of the car and injured. The supreme judicial court of Massachusetts says that it does not think that the conductor was under any obligation to wait until the woman had become seated before giving the signal to start. Nor was he bound to notify her that he was about to give the signal.

Injury to Switch Cleaner Riding Between Switches on Employe's Ticket on Sunday.

Shannon v. Union Railroad Co. (R. I.), 63 Atl. Rep. 488. Mar. 7, 1906.

The plaintiff after cleaning a switch boarded a car to proceed to another switch to perform a similar task. He gave to the conductor an employe's ticket which had been furnished by the company. Before he reached his destination, however, he was injured by a collision between the car on which he was riding and another car of the company. In an action to recover damages, the supreme court of Rhode Island holds that he was properly nonsuited, on the ground that the negligence of which he complained was that of a fellow servant. It says that he was traveling to perform his customary work at the time of the accident, and clearly sustained the relation of an employe rather than that of a passenger at the time. Nor does it think that it should make any difference in the case that the time was Sunday, when, it was alleged, the running of cars was an illegal act, because in violation of the Sunday law of the state, and no valid contract creating the relation of master and servant then could exist. It says that if the operation of the cars on Sunday was lawful, as being a work of necessity, within the meaning of the statute, clearly he was not entitled to recover for the negligence of a fellow servant. But if the act of the company was illegal, the act of the plaintiff was equally so; and the law leaves him where it finds him.

Duty of Motorman With Reference to Teams the Drivers of Which Cannot See Behind Them.

Williamson v. Old Colony Street Railway Co. (Mass.), 77 N. E. Rep. 655. Mar. 5, 1906.

A car having collided with a four-horse barge filled with furniture and so constructed that the driver could not see behind him as he was attempting to cross the tracks diagonally, the supreme judicial court of Massachusetts says that it was the duty of the motorman to notice the apparent movement and consider the probable movement of teams traveling before him in the same direction, especially if the driver was so seated that he could not see a car approaching behind him. The driver of such a team as this has a right to suppose that a motorman, coming from behind, will give him time to cross the tracks after he has started to do so, and not run against him while he is crossing. While it is his duty to use reasonable care for his own safety, he may trust something to the expectation that others will do their duty.

Injury to Passenger from Fall of Back of Seat Due to Breaking of Armature—Crack Discoverable by Inspection—Different from Case of Flaw.

Gould v. Boston Elevated Railway Co. (Mass.), 77 N. E. Rep. 712. Apr. 3, 1906.

The plaintiff while a passenger in an open car was injured by the back of the seat in front of her falling on her knee. The fall of the back of the seat was caused by the breaking of the metallic armature (an inch and a quarter thick), by which it was attached to the post on the side of the car. The plaintiff's witnesses testified that after the accident they examined the break, and half of it was bright and the other half was "rusty," "black," "dull," and "corroded." The supreme judicial court of Massachusetts gives judgment on a verdict for the plaintiff. It says that in its opinion this evidence warranted a finding that the arm was cracked before the accident, and that it is also of the opinion that if it was cracked, as the testimony indicated, the jury was warranted in finding that the crack would have been seen on inspection. The case of Harnois v. Cutting, 174 Mass. 398, 54 N. E. 842, relied on by the defendant, was the case of a flaw, not a crack.

Care Required with Regard to Operating and Places of Stopping Electric Cars—Knowledge Chargeable to Employes and their Duty—Passengers Without Same Duty and Not Negligent—When Stopping Invitation to Alight.

Mobile Light & Railroad Co. v. Walsh (Ala.), 40 So. Rep. 560. Apr. 3, 1906.

The jury was instructed in this case that railroad companies operating their cars by electricity are required to exercise the highest degree of care, both as to the operation of the cars and providing places for the discharge of their passengers from their cars. The supreme court of Alabama says that such is the law when applied to the facts of this case, in which the evidence tended to show that the plaintiff asked to have the car stopped at a certain crossing, and on its being stopped 50 or 100 feet beyond it asked that it be backed up because that was a bad place to alight. For, the court says, it will scarcely be denied that the stopping of the car for passengers to alight from it is in a sense providing a place for such passengers to alight. It also says that the defendant's servants were charged with the duty of knowing whether the place was reasonably safe, and, if its unsafe condition could have been discovered by them by the exercise of that degree of care required, they must be charged with the knowledge of that condition. No such duty was imposed upon the plaintiff, and she could not be held to be guilty of negligence as matter of law, unless the place where she alighted was obviously dangerous. Moreover, a correct principle, the court says, seems to be announced by an instruction to the jury that, "When the car is stopped at or near the place when the passenger gives the signal for it to stop, or has directed or requested it to stop—that is, when the car stops just beyond such a point a short distance—that may be taken as an invitation to alight."

Injury to Pedestrian by Fender on Car Backing Around Curved Switch.

Hoffman v. Philadelphia Rapid Transit Co. (Pa.), 63 Atl. Rep. 409. Feb. 26, 1906.

A woman stopping near the center of a car which had stopped and which was about to back around a curved switch was struck by the car's fender as it backed around the switch, the fender during the time of backing being on what was then the rear end of the car. In reversing a judgment for damages and entering it for the defendant, the supreme court of Pennsylvania holds that there was no negligence shown on the part of the defendant, but contributory negligence on the part of the plaintiff. It says that in the absence of any evidence showing that the use of the fender by the defendant was not a proper one, a jury could not be permitted to draw an inference of negligence. On the other hand, if the plaintiff saw the danger, or should have seen it under the circumstances, and could have avoided it by the exercise of reasonable care, and of this there was no doubt, it was her duty to do so, and failure to perform her duty defeated her right to recover damages.

Entitled to Show Meaning of "White Poles" as Established Stopping Places—Starting of Car on Signal Given by Unauthorized Person.

Moore v. Woonsocket Street Railroad Co. (R. I.), 63 Atl. Rep. 313. Feb. 2, 1906.

The defendant company having, without objection, placed in evidence a plan showing the street where the plaintiff's wife was injured in attempting to alight from a car, with the location of "white poles," and other details, the supreme court of Rhode Island holds that it was error to rule out a question as to whether the company had any established stopping places on the street, the purpose of this question being to lead up to an explanation of the meaning of "white poles," etc. The court says that it would have been proper to allow the defendant to explain fully what was the meaning of the "white poles," shown upon the plan. The jury could not be presumed to know what the meaning of the "white poles" was, and, as they had been shown to exist, they should have been explained. If it was the fact that these "white poles" were, by rule of the defendant, "established stopping places," at the time of the accident, it would have been competent for the defendant to show that fact, and its relation to the rules as to the stopping and starting of cars for passengers to alight or board the cars.

The court also holds that it was error to refuse to charge the jury (1) That if they found that the car upon which the plaintiff's wife was riding came to a full stop, and before she had fully alighted was started upon a signal to start being given by some person not authorized by the defendant to give such signal, then the verdict must be for the defendant. (2) That if they found that the car came to a full stop, and before she had fully alighted therefrom was started upon a signal to start being given by some person not authorized to give such signal, and if they further found that the accident which happened could not have been prevented after the giving of such unauthorized signal by the exercise of due care on the part of the conductor or motorman in charge of said car, then the verdict must be for the defendant. The court thinks that the principle of law involved in these requests is sound.

Electric Railway Company Has Superior Right to Use Its Tracks in Highway—Duty of Driver of Team Meeting South-Bound Car on North-Bound Track.

Minnich v. Wright and Others, Receivers of Lehigh Valley Traction Co. (Pa.), 63 Atl. Rep. 428. Feb. 26. 1906.

The right of an electric railway company to use its tracks although laid on a public highway, the supreme court of Pennsylvania says, is superior to that of a pedestrian, or an individual driving a team. In this case a man driving north on the east track, after a heavy snow had fallen and the track had been cleared by throwing the snow to either side of it with a snow-plow, met at a curve a car coming on that track. The court says that it was his duty to watch for an approaching car, and if he saw one on the track on which he was driving, he was required to leave the track, and permit it to pass. If, therefore, as alleged by the defendants, he saw, or could by proper care have seen, their car, he should have turned from the track, or if that was not practicable by reason of existing conditions, he should have warned the motorman of the fact. If he failed in this duty he was negligent. The court also says that it was the duty of the crew in charge of the car to have observed the care required of them under those circumstances.

Liability for Killing of Hog—Burden of Proof—Statute Making all Railroads Responsible for Damages from Running Trains Not Applicable to Street Railways—No Presumption of Negligence in Killing Stock.

Little Rock Railway & Electric Co. v. Newman (Ark.), 92 S. W. Rep. 864. Feb. 10, 1906.

This was an action against the company for an alleged negligent killing of a hog. The hog, the supreme court of Arkansas says, was outside the "stock limit," and it was not, therefore, contributory negligence for it to be running at large. But the burden was upon the plaintiff to show that the hog was killed through the negligence of the company. Section 6773 of Kirby's Digest, making all railroads responsible for all damages to property caused by the running of trains in Arkansas, is not applicable to street railways. They do not run trains in the sense in which the term was intended by the lawmakers. The whole act of February 3, 1875, shows that the legislature did not have in mind street railways. This court has often held under this statute that, where stock is killed by the running of trains, there is a presumption that such killing was through the negligence of the company operating such trains. But no such presumption prevails in the case of street railways. In such cases it is not a question of presumption, but a matter of proof.

Shocks on Various Parts of Line May Be Shown as Evidence of Condition of Road and Cause of Injury.

Vicksburg Railway & Light Co. v. Miles (Miss.), 40 So. Rep. 748. Apr. 30, 1906.

This was an action to recover for injury to a horse. The supreme court of Mississippi says that it could not be doubted that the injury to the horse was caused by a loose connection of the bond wires, preventing proper ground connection, thus causing an arc along the track on the passage of the train. To show that this did not arise from an unavoidable accident, not to be foreseen or provided against, but that it was because of long-continued negligence over the whole of the road, and which was the subject of complaint to the company, as cumulative evidence that electricity caused the hurt, it was competent to show other shocks to other animals in other parts of the line, operated by one current, and complaint made. This involved no danger of a confusion of issues. An electric current over a car line is a continuous stream, and, properly bonded and connected, is free from danger, and a matter of easy proof by the operator. In showing that electricity, negligently controlled, was the origin of the particular event, it was properly allowed to show other instances of similar results, along the same circuit. It was of the same nature as evidence of frequent emission of sparks by an engine to show its negligent construction, and adding to the probability that it set out the particular fire. An electrical current over the same conductor is just as much one thing as an engine is.

Passenger on Steps of Crowded Car Releasing Hold to Pay Fare Guilty of Negligence.

South Covington & Cincinnati Street Railway Co. v. Physioc (Ky.), 92 S. W. Rep. 305. Mar. 23, 1906.

When a passenger standing on the steps of a platform of a crowded car released his grasp on the handhold, the retention of which made his otherwise perilous position secure, the court of appeals of Kentucky says that this was a voluntary act for which the company was in nowise responsible. The request of the conductor, that he pay his fare, was not of that urgency which required him to imperil life or limb in an effort to comply with it. He could have explained to the conductor his position, or he could have crowded in further, or requested the conductor to stop the car and let him get off, rather than place himself in the peril which was involved in his releasing his grasp of the handhold while the car was being rapidly propelled along the track. It takes but little familiarity with street cars and natural laws to know that if a passenger stands on the edge of the platform, without holding on to something to prevent him from falling, when the car strikes a curve—whether it be going fast or slow—he is in great danger of being thrown off. The passenger here knew this, and, so knowing, he had no right—at the expense of the company—to imperil his life or limb in the manner stated. His negligence in this matter was too plain for dispute.

Responsibility for Acts of Employes and Wrongful Arrest of Passenger Through Instrumentality of Conductor—Cannot Escape Obligations by Instructions.

Schmidt v. New Orleans Railways Co. (La.), 40 So. Rep. 714. Jan. 15, 1906. Rehearing denied Feb. 12, 1906.

In affirming a judgment for damages against the company for the arrest of the plaintiff while a passenger on one of its cars through the instrumentality of the conductor indicating to a police officer that he thought he might be a pickpocket, the supreme court of Lousiana says that it does not think that the conductor was in this case malicious. On the contrary, though acting erroneously, carelessly, and to the great injury of the plaintiff, his acts were in the line of the discharge of his duty to his employers and in their supposed interest, and not his own. The railway company by reason of its act of incorporation came under certain obligations for the safety and protection of the public and particularly of its passengers, and it had for that purpose to act through employes for whose acts in that regard it assumed responsibility.

The conductor of the street car represented in this instance the street railway company. The company could not free itself from the obligations referred to by failing to give its conductors full and proper instructions, or by restricting the limit and extent of their authority so as to disable them from properly performing duties which it was inherently necessary and essential they should have in order to carry out to the extent of legal requirements the functions of the position in which they were placed. It could not, by merely enjoining upon the conductors to perform their duties cautiously, prudently and well, break the effect of their failure to comply with these injunctions, nor could it, by throwing its instructions in the form of prohibitory orders, alter the legal scope of their power, duties and authority. These were matters which it could not lessen and make to fall below the limits affixed to the positions themselves by operations of the law itself.

Further, the court says that it does not underrate the difficulties in which railroad companies are placed by the heavy responsibilities thrown upon them by the law, but these responsibilities they voluntarily assume as being compensated by the privileges conferred by the state. Being assumed, they must be met.

A Company may be Compelled by Mandamus to Change Grade and Line of Tracks to Conform to Changes in Street.

People v. Geneva Waterloo Seneca Falls & Cayuga Lake Traction Co. (N. Y. Sup.), 98 N. Y. Supp. 719. May 2, 1906.

Where tracks have been located and constructed in accordance with the grant of the board of trustees of a village so that it may be assumed to be within the protection of the constitutional provision prohibiting the impairment of contracts, nevertheless the fourth appellate division of the supreme court of New York holds that, the village having become a city, and the city having the necessary charter power or authority, the city can require the grade and line of the tracks to be changed by the company to conform to the grade and line of the street as established by the city's board of public works. It says that the propositon is intolerable that a street surface railroad company, or other corporation which may be given a license to occupy the streets of a municipality in a particular manner, may not be compelled, when the conditions and locality change, when public convenience and necessity require, to make such changes in its grade or line as the public necessity may demand. Any other rule would make it possible for a railroad company to forever prevent improvements and development in a particular section of the municipality—would make it the arbiter as to what might or ought to be done for the improvement or benefit of any particular locality. And mandamus, the court thinks it is well settled, is the proper remedy by which to enforce the performance of this duty by the railroad company.

Validity of Requirement for Repaving Between and Along Tracks as Condition for Authority to Use Electricity—Not Annulled by Taxing Act.

Inhabitants of City of Trenton v. Trenton Street Railway Co. (N. J. Sup.), 63 Atl. Rep. 1. Feb. 28, 1906.

Where it was alleged that a company, being desirous of substituting electricity as the motive power of its cars, applied to the municipal authorities for permission to do so, and for authority to erect poles in the public streets, and string wires thereon for the purpose of supplying that power, and that such permission was granted on condition, expressed in the ordinance, that when any street should be ordered repaved the company should repave the portion inside its rails, between its tracks and for two feet, if a double track, and three feet, if a single track, outside the outer rails thereof, which ordinance the company accepted in writing, under its corporate seal, the supreme court of New Jersey holds that the obligation thereby imposed rested upon the agreement of the parties, and was independent of any question of lack of power inherent in the municipality to compel the company, or its successor in ownership, to repave any portion of the public streets against its will and without its consent, or to exact a contract from the company requiring it and its successors to assume the burden.

Nor does the court consider such a contract ultra vires (beyond the corporate powers) of the municipality. The substitution of a power which would enable the cars to be operated at a much higher rate of speed than was possible when drawn by horses, thereby naturally tending to drive other vehicles off those portions of the highway occupied by the tracks, and thus increasing the wear and tear upon the remaining portions thereof, and rendering more frequent repaving of the streets necessary, and the erection of poles in the streets, with wires strung thereon, charged with a dangerous current of electricity, the court says, tend in fully as great a degree to an increase in the burdens of the municipality as does the original construction of the railroad; and if the legislature made the consent of the municipality requisite to the original construction, in order that provision should be made to meet, or mitigate, the municipal burdens growing out of such construction, a similar object must have been intended by that body in requiring the consent of the municipality to a change in motive power, and the accompanying erection of poles and wires in the public streets.

Moreover, the court holds that the obligation which the ordinance under consideration imposed, having been voluntarily assumed by the company in consideration of the privilege granted by the ordinance, and not imposed upon it as a tax, was not annulled by the act of March 23, 1900, providing for the taxation of all the property and franchises of corporations using or occupying public streets or highways, Section 8 of which act declares that the franchise tax provided by the act shall be in lieu of all other franchise taxes then assessable against corporations using the public streets.

Passing Behind Car to Cross Other Track Without Stopping for Good View Contributory Negligence—Decisions of Different States Summarized—Danger as Great from Stepping on Electric Railway Tracks as on those of Steam Railroads and Requirements as to Looking, Listening and Stopping are Same.

Hornstein v. United Railways Co. (Mo.), 92 S. W. Rep. 884. Feb. 22, 1906.

The plaintiff having alighted from a south-bound car immediately passed around the rear thereof to cross the other track and was struck by a north-bound car. The supreme court of Missouri, division No. 1, says that this was negligence of the most pronounced sort. It was the plaintiff's duty, in the circumstances, to have stopped and waited until he could see whether or not there was an approaching car on the east track before blindly proceeding to cross over that track. Common prudence would have dictated, when the south-bound car began to move away, that the plaintiff stop for a moment that he might have an unobstructed view of the east track and see whether or not it was safe to proceed across the street. His failure to exercise this precaution was negligence, and there is no escape from the conclusion that this act of negligence contributed to and was the proximate cause of his injury; where this is the case, the law is well settled that no recovery can be had.

Again, the court says that cases cited by counsel for the plaintiff differentiate between steam railroads and street cars, and, while conceding that it is contributory negligence for a person to thus enter upon or near a steam railroad, under circumstances like those here presented, hold that it is not contributory negligence for one so to do with reference to street cars. In fact, some of them go to the extent of holding that it is not the duty of the person to stop, look or listen before attempting to cross a street car track. On the other hand, counsel for the defendant cited a number of cases which hold to the rule that where a person deliberately walks from behind a street car, from which he has alighted, and attempts to cross a public street without using his powers of observation, and is injured by an approaching car, which could have been avoided by the use of ordinary care, he cannot recover damages for such injury.

The sum of the matter as to the state of the law in other jurisdictions may be said to be that in Ohio, New York, Virginia, Illinois, New Jersey, Washington and Indiana the rule contended for by the plaintiff obtains, and likewise the distinction between steam railways and street cars also obtains, or did obtain before the adoption of rapid transit, such as now exists in all large cities. Whereas, in Pennsylvania, Maryland, Oregon and Tennessee the rule stated by the defendants obtains.

The later cases in Missouri do not recognize such a distinction between steam railroads and street railroads, with respect to the obligation of the pedestrian to look or listen for an approaching car, and, if necessary, stop, but the courts of this state, keeping pace with the progress of the times, recognize that there is quite as much danger to be apprehended now from stepping on the street car tracks, where the cars are run by electricity and at a rapid rate, and with great frequency and at short intervals, as there is from stepping on the steam railroad tracks, where the cars do not run as often. And therefore common prudence requires increased care on the part of the pedestrian in proportion to the dangers to be apprehended.

Duty to Protect Passengers from Assaults and Outrages—Company Insurer as to Acts of Employes—Contract for Considerate and Courteous Treatment—Use of Force in Ejection of Passenger—Conductor Not Required to Degrade Manhood but to Exercise Self-Restraint—Prohibition of Smoking in Closed Cars Reasonable Regulation.

McQuerry v. Metropolitan Street Railway Co. (Mo. App.), 92 S. W. Rep. 912. Feb. 5, 1906. Rehearing denied Mar. 3, 1906.

Not only is the duty upon the carrier to exercise the highest degree of care during the transportation of the passenger to protect him against assaults and outrages, whether offered by strangers or by the carrier's own servants, but, the Kansas City court of appeals says, that duty continues until the passenger has left the vehicle in safety at his destination. As to the acts of its servants, the duty of the carrier is that of insurer. Its contract to carry safely implies an agreement for considerate and courteous treatment of the passenger by the carrier's servants. And if it becomes necessary for the carrier to eject the passenger before the end of his transportation, because of the misconduct of the latter, no more force must be employed than is required to accomplish the removal of the passenger from the car. If the carrier fails in the performance of any of these duties, it is liable to the passenger for any injury thereby sustained.

The court does not mean to say that a conductor must degrade his manhood and tamely submit to gross insult; but in serving the public and in performing his master's contract to treat passengers with all due consideration, he is expected to exercise some degree of self-restraint, and not to fly into a rage and misbehave at every impertinence from a passenger. His right and duty to eject a passenger on account of misconduct, not grossly insulting or offensive, does not justify him in assaulting the passenger, unless the resistance of the latter during his removal is of a nature to make physical violence an imperative necessity.

On the other hand, the passenger is in duty bound to conduct himself in a decent and orderly manner. He should observe and obey the reasonable rules established by the carrier for the benefit of its service or for the safety, convenience and comfort of its other passengers, and, if he refuses to do this, he forfeits his rights under the contract of carriage, and subjects himself to removal from the car.

A company's prohibition of smoking in its closed cars, which are used alike by all classes and conditions of people, is a reasonable regulation. It is essentially for the comfort of the public, and the court does not hesitate in saying, as a matter of law, that a passenger who persists in disobeying it, after his attention is called to it, deserves expulsion from the car.

PIPING AND POWER STATION SYSTEMS.—XXI.

BY W. L. MORRIS, M. E.

Pump Branches.

Each branch from a boiler feed pump should be provided with a stop valve of the gate pattern so that the pumps can be shut off from the main. Between this valve and the pump there should be a check valve and a pressure relief valve. It is possible to operate the pump without any one of the three valves, but if the safety of the pump is to be considered, the relief valve is necessary. To insure the continuous operation of the pump it is necessary to use an outside check valve. A swing check will be found most satisfactory for this service.

Instead of introducing a tee for the relief valve the detail shown in Figure 202-(D3-1) will be found more compact and more economical. The pressure from the pump is free to pass the check valve, the relief in this position protecting the pump quite as fully as though it were directly on it. The relief valve should be about one-half the size of the discharge pipe. The outlet should be left open to the atmosphere to show when it is discharging so that an operator will be more careful to avoid overpressure in the line or pump when by discharging over the floor it leaves unmistakable evidence of his carelessness. The relief should not be placed between the pump stop valve and the feed main with the idea of protecting the main. The relief valve should protect the pump as it is not an unusual oversight for an operator to start a pump with the discharge valve closed. It is quite useless to place the relief valve on the feed main as there is nothing to cause excess pressure between the pump and the boiler valves unless there should be an increase in the temperature and the volume of water confined between these valves.

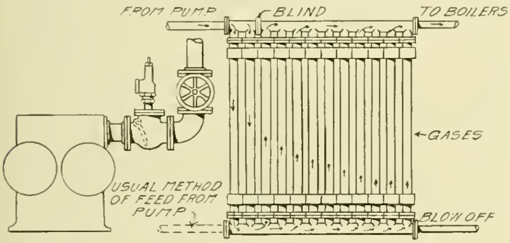


Figure 202-(D3-1). Figure 203-(D4-1).

If a closed heater or economizer is used there should be a relief valve placed between the inlet and outlet water valves which would protect the heater should heat be turned on when the valves are closed. If the relief valves are placed in this manner there is then no necessity for placing a relief valve on the main itself. If the pumps are provided with suitable relief valves the relief valve for the heater or economizer may be made small. The relief valves used on the heater and economizer serve to relieve the pressure due to expansion and need not be over ¾ inch in size.

Connections to and from Economizers.

The regular method of feeding water to and taking it from an economizer is to introduce the water at the bottom and discharge it from the top, with the flow of the water in a direction opposite to that of the gases. If the installation is of such a nature as to make it necessary to both receive and discharge the water at the top, the upper manifold may be blanked so that the water will not take a direct path from the inlet to the outlet.

In the arrangement shown in Figure 203-(D4-1) a solid disc of thin copper is placed between the two gaskets in the upper sections of the manifold. The water takes a downward course in the first two sections and is delivered to the lower manifold which in turn delivers the water to the bottoms of all of the remaining sections. It will be noted that in all but two of the sections the hottest water is at the top and since the hottest gases also lie at the top there is extreme difference of temperatures which will induce a circulation of water. The water passes slowly and freely, always moving in the one direction. With such a path water from the first section may be of low temperature while the water in the outgoing sections is quite hot.

The usual method of feeding by which the water enters the bottom of the economizer is shown by the dotted lines in Figure 203. With this arrangement, if the pump is fitted with a governor, since the bulk of the water flows through the lower manifold which is not exposed to the high-temperature gases, there is less danger of the cold incoming water cracking the tubes when the economizer is blown off. In Figure 203 the lower manifold is below the lower headers. This detail should be avoided wherever possible. The gaskets are difficult to place and if renewals are necessary such repairs must be made in an inconvenient place.

The detail shown in Figure 204-(D4-2) should be used even though it is expensive. The objectionable manifold below is shown in dotted lines at a. To permit the ready removal of a damaged section one wall should be of asbestos lined sheet metal. The top of the economizer should be covered with asbestos and means should be provided for attaching chain blocks over the economizer sections to facilitate their removal. It will be noted that all gaskets shown in Figure 204 are open to inspection even while in operation. In case of a slight leak the joints can be followed up without interfering with regular operation.

Branches to and from Closed Heaters.

The exhaust closed heater and the closed heater that may be used in the line of the vacuum exhaust, should be provided with relief valves as previously stated. Where there is an abundance of exhaust steam there is no perceptible saving in heat units by the use of an open exhaust heater and with a closed heater, since the feedwater is kept separate from the exhaust, the difficulty of eliminating cylinder oil from the exhaust is overcome. U-shaped copper tubes are not subject to expansion strains and therefore are suited for this class of heaters.

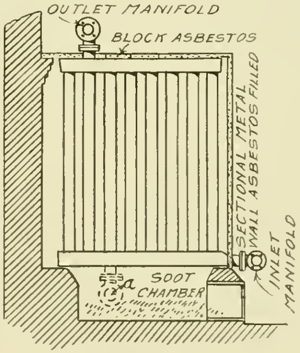


Figure 204-(D4-2).

There are two distinct types of closed heaters, the steam-tube and the water-tube types. Figure 205-(D5-1) shows the water-tube type and Figure 206-(D5-2) the steam-tube type. The form shown in Figure 206 has been used more extensively than the water-tube type notwithstanding the fact that the area for the exhaust is much more restricted than in the water-tube type, which is a condition that would make the heater somewhat more efficient at the expense of engine economy. The heating surfaces of the tubes in the steam-tube type are very efficient, due to the rapid flow of steam through the tubes and the complete removal of the air that may be contained therein. The outside casing, a, of the steam-tube type of heater is subjected to the full boiler pressure and is exposed to the eating action of the water. If the feedwater contains a large amount of carbonate of lime or magnesia, considerable scale will form in the heater. In the form shown in Figure 206 it is easier to remove scale from the outside of the tubes than from the inside.

The closed heater is superior to the open heater only because cylinder oil in the exhaust steam is kept out of the feedwater. If the water used tends to form scale the open type of heater, with ample space for accumulating scale, should be used. The oil should be removed with a grease extractor. The closed heaters have small hand-hole plates for removing the deposits in them and by the use of a large amount of chemical with the heater shut off from the system, it is in some cases possible to loosen the scale sufficiently to allow it to be washed out through the hand-hole openings. In steam-tube heaters the water should be fed to the heater at a low point and taken from the heater at a high point with its blow-off at the extreme top of the heater to remove floating impurities. The feed branches should be by-passed so that the heater can be shut off and the feed go directly to the boilers. A thermometer cup should be placed between the stop valves and the heater as indicated at b, in Figure 206, so that it can be repaired when the heater is shut off. There should be no stop-valve placed between the small relief, c, and the heater. It is preferable to place the relief, c, directly on the heater to lessen the possibilities of impurities blocking the connecting pipe.

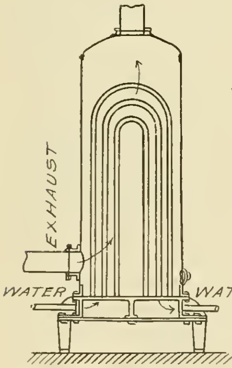


Figure 205-(D5-1).

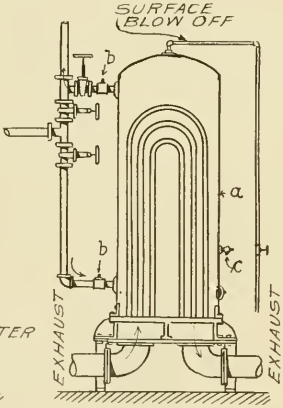


Figure 206-(D5-2).

Branches to and from Live Steam Purifier.

The usual means of installing a live steam purifier is to place it at a sufficient elevation above the boilers so that it will feed by gravity. This arrangement is shown in Figure 207-(D7-1). The purifier is maintained under full boiler pressure. The pump delivers water to the scale-collecting pans at the top of the purifier after which the water overflows from one pan to another and is finally discharged into the bottom of the purifier. By virtue of the head, a, the water is delivered from the purifier to the boilers. This head must be greater, measured in pounds per square inch, than the combined losses of the steam through the steam pipe, b, the water line to the feed main, c, the feed main, d, and the branches, e. These losses will include friction through the pipe fittings, check and feed valves and the filter, f, should a filter be installed in the purifier. There is another loss that may interfere with the feeding of some one boiler in the battery. This loss would be due to that particular boiler being crowded much harder than the others, while they were taking water and carrying as much higher pressure as the resistance of the steam line would amount to. If there is headroom it will lessen the cost of installing the purifier to make the head, a, about eight feet and use ordinary sizes of feed main branches, etc.

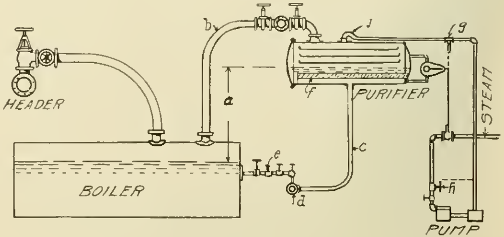


Figure 207-(D7-1).

There are two methods of delivering water to the purifier, one as shown in the illustration with a float to control the steam to the pump. This arrangement is especially suited for a plant with but one purifier. If there are a number of purifiers, each supplying one or two boilers, it is necessary to connect the float with the water-admission valve shown by the dotted lines at g, and use a pressure-controlling pump governor shown by the dotted lines at h. In this case the pump will maintain a set pressure in the purifier feed-main and each purifier will take water independent of the others. The goose neck, j, in the discharge to the purifier is used for the purpose of sealing the water line and preventing it from draining into the purifier. Such draining would cause serious water hammer when the water started feeding again and steam would also mingle with the water in the pipe. A purifier is one of the station appliances the use of which may cause more or less trouble, but if properly installed it can be operated with very little attention. In cases where the feedwater carries a considerable amount of sulphates a purifier will aid materially in keeping the boilers clean and is the only means, aside from chemical treatment, that will remove the sulphates before the water reaches the boilers.

Branches to and from Injectors.

Injectors are so little used in the large power plants that they seldom enter into station plans or systems. It has become quite a general practice to install two feed pumps even in small plants. The only advantage offered in the use of an injector in power plants is the means afforded for feeding warm water when for any reason the heater may be out of service. Feeding boilers with cold water may cause damage much in excess of the cost of an injector and its use is therefore safer practice. The injector may be connected with the same suction, discharge and steam lines as the pump, using a stop-valve for each of the three branches.

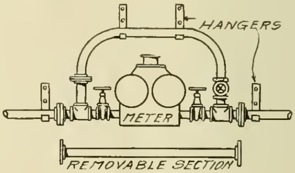


Figure 208-(D9-1).

Branches to and from Meters.

As a rule meters in power plants are only used for testing purposes. Meters should be installed in by-passes and if a separate meter is used for each boiler the most direct connection through the meter should be used, as the meter itself offers obstruction to the flow of water. This arrangement is, however, open to the objection that the meter by-pass is in use the greater part of the time, and any added friction would tend to become a regular operating loss. When some of the boilers in service are operated with meters and the others are not, it would then be necessary in order to control the feed, to close the feed-regulating valve almost tight upon its seat and hold back the feed, which service is severe upon the regulating valve. Instead of placing a separate meter on each boiler branch, one meter fitted with a by-pass, flanges, etc., can be used on all the boilers, all boiler branches having exactly similar straight sections flanged at each end so that they can be removed and replaced by the meter.

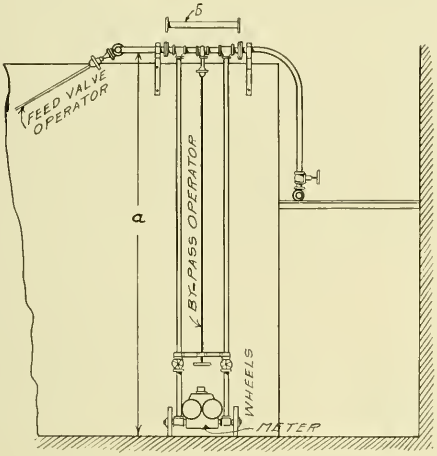


Figure 209-(D9-2).

Figure 208-(D9-1) shows a meter arranged in the manner just described and also the removable straight section. The hangers which support the ends of the pipe when the removable section is out are shown and also other hangers which support the meter and enable a ready connection of the flanges. The section can be removed and the meter installed while the boiler is in operation as the connection requires but a few minutes to make. An advantage in using the same meter for the different boilers is that the readings will be relatively the same and an exact comparison of the performance of the different boilers can be had. With different meters on the different boilers one may read in excess of the exact quantity, since all mechanically registering meters are inaccurate to a greater or less extent.

Another method of measuring the water to boilers was described in a previous chapter under the head of "Boiler Feed Systems." In this method one large meter is placed between the auxiliary feed and the regulating feed main and the water allowed to flow through the meter to the auxiliary mains for such boilers as are to be tested. The boilers have separate feed branches to each main. The most objectionable feature found in such a system is that a meter of sufficient size to accurately record the water flow for a large number of boilers is inaccurate when used with a small flow through it, as would be the case if a test were made on but one boiler. Another disadvantage is found in the use of many valves which open into other boilers and lines and which in case of leaks, would permit water to pass the meter and go elsewhere than into the boiler that was being tested.

If the feed branch to the boilers is inaccessibly located the detachable boiler meter can be located in the by-pass and placed close to the floor with two wheels mounted on an axle screwed into a tee as shown in Figure 209-(D9-2). In order that the meter may fit the different locations the distance, a, should be maintained either when placing the branches to the boilers or when putting down the floor. With this arrangement one man can roll the meter to the desired boiler and place the by-pass between the removable section and the boiler wall. When he is ready to remove the straight section, b, the meter connection may easily be swung into place.

Branches to Hot Water Plumbing Fixtures.

Ordinarily, the water fed to the boilers is sufficiently hot for lavatory use. It is not good practice to take water from the feed mains for any other purpose than for boiler feeding, but as the amount used in a lavatory is small it is better to take the water from the feed mains rather than provide a steam heater. If the line from the feed main to the lavatory is very long it should be of ⅜ or ½-inch pipe, covered to reduce the water loss occasioned by wasting cold water at the faucet when warm water is desired.

There are two distinct methods of supplying water at the wash basins or sinks. One is to carry it under full boiler pressure to the point where it is wanted, using a standard high-pressure valve in place of the ordinary plumbing fixtures. The other method is to lower the pressure to say 20 pounds by means of a reducing valve and use standard plumbing fixtures. This latter method is liable to cause considerable trouble, especially if the water is from an economizer at a temperature higher than the steam for the pressure of which the reducing valve is set.

The use of the reducing valve is not alone sufficient to protect the plumbing fixtures from over pressure since all reducing valves will allow the pressure past the valve to increase by reason of the leakage when the flow is slight. With water a very small amount of leakage, possibly half a pint, will raise the pressure of the water on the low-pressure side to that on the high-pressure side. In order to protect the plumbing fixtures it is necessary to use a relief valve on the side that has become reduced in pressure in order to waste water when the pressure increases. Such service, however, is very severe on both the reducing valve and the relief valve since the leakage past the valve faces will soon cut them out, allowing the leakage cost to run into an appreciable amount.

A much simpler method is to use extra heavy materials throughout and avoid complicating the operation by the use of low-pressure plumbing fixtures. A very satisfactory detail for this work is to make both hot and cold faucets of extremely heavy angle valves with brass handwheels and a small polished brass sleeve under the valve as shown in Figure 210-(D10-1). Fixtures fitted in this manner are free from the continuous troubles that the reducing valves and reliefs always develop.

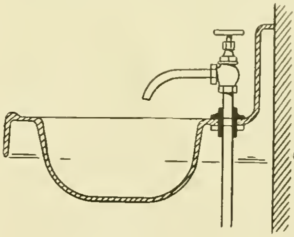


Figure 210-(D10-1).

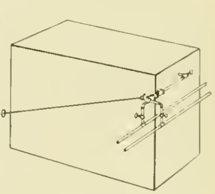


Figure 211-(E2-1).

Auxiliary Boiler Feed Mains.

The pipe line used as an auxiliary feed for the boilers is often designated as a feed main, though in reality it is a general service main having boiler connections that enable its use as a feed main when desired. The regular duties which this main performs include the following: low-pressure hose service for wetting ashes, washing floors, etc., filling boilers through its feed branch after cleaning, boiler washing, water supply for turbine tube-cleaners and fire protection service in the boiler room. The method of connecting the auxiliary boiler feed main has been shown in an earlier chapter on feed mains.

Since it may be called upon to perform the same duties, the construction of the auxiliary main should be as thorough as that of the boiler feed main, but as such duties would be infrequent smaller pipe may be used. The difficulties encountered in feeding the boilers through small mains would occur for such short periods of time that saving in the cost of piping should determine the relative sizes of the boiler feed main and the auxiliary main. For the same reason the auxiliary main should not be covered as the saving in heat during the short use of the piping for boiler feeding purposes will not warrant the original outlay for heat insulation.

No boiler plant should be installed without an auxiliary boiler feed main as its uses aside from boiler feeding are important ones and water for them should not be supplied from the boiler feed main.

Branch from Auxiliary Main to Boilers.

In Figure 189-(D1-8) was shown a satisfactory connection between the boiler and the auxiliary feed main. The two mains were shown side by side on the same supports. These supports also were designed for carrying a plank runway.

Another method of connecting the auxiliary feed main to the boiler is shown in Figure 211-(E2-1). The single feed valve with its extension stem, check and boiler stop-valve serves both mains. If the feed and check valves are installed as earlier shown in Figure 190-(D1-9) this connection will not be a cause of trouble, but with feed and check valves screw-connected into the feed branch, it would not be safe to attempt repairing them unless the boiler were shut down. With the double set of feed and check valves, as shown in Figure 189, it would be but a few minutes' work to put the auxiliary main into service so that the boiler could be fed through its auxiliary feed and check valves, thus allowing the repairs to be postponed until a convenient time. The presence of twice as many feed and check valves does not signify that any extravagant outlay has been made, as the operator will always have in reserve "good valves" in the auxiliary main, and thus he will be able to transfer the valves in good condition to the regular main and use the old valves in the auxiliary main when they become badly worn.

Connections Between Pumps and Auxiliary Main.

Ordinarily it is the best practice to use two feed pumps for boiler-room service. These pumps should be of the same pattern and size and specially designed for boiler feeding. Their discharges should connect into a single main with a valve between the pumps, one end of the main connecting with the regular feed main and the other end with the auxiliary main. By placing a valve in the auxiliary main it is then possible to use either one of the pumps for feeding purposes or each can be separately used, one furnishing water for boiler feeding and the other for tube cleaning, boiler filling or any similar service.

If fire service of a limited amount be required the auxiliary main may be used for such purpose, this main then being fed by one of the regular feed pumps. If, however, the buildings and plant are to be insured it will be desirable to install a standard pattern underwriters' fire pump with such a capacity as the insurance board may direct. Before deciding upon the use and purchase of the reserve feed pump the insurance details should be studied and advice sought from the underwriters as to what capacity of pump they will insist upon having installed. The underwriters' pumps are made to conform to their standard specifications and are designed to carry 150 pounds pressure. Some of the makes recommended will barely comply with the specifications and others are generously designed so that they will carry far greater pressures, supply a larger quantity of water and are in every way better able to withstand service.

If the fire pump is also to serve as a reserve feed pump it should be one of the better makes. A ready means of roughly determining this point is by asking the bidders for the pump contracts what weight of pump they propose to furnish. For fire protection it is best to have the fire pump in continual easy service as this practice assures that the pump will always be in operating condition should it be suddenly called upon for fire duty. This class of daily service is approved by the insurance companies and in fact they approve of using pumps with high and low-pressure steam ends that will serve for all ordinary uses, such pumps being supplied with a quick-throw valve that will change both cylinders into high-pressure ones for fire service.

Branch from Auxiliary Feed Main to Hydraulic Tube-Cleaner.

The branch from the auxiliary main which supplies water to hydraulic tube-cleaners should be taken off at a convenient point for attaching the hose. A gate stop valve should be placed at the main and means provided for attaching a valve at the end of the branch, this valve being shifted with the hose from one cleaner branch to another. The operating valve must be located so that it can be reached from the platform used when cleaning boilers. Figure 212-(E4-1) shows such a branch when provided with a quick-operating valve, a, a rigid hanger, b, to relieve the strains due to shifting the hose, and a stop-valve, c, that is left open when the valve, a, has been attached.

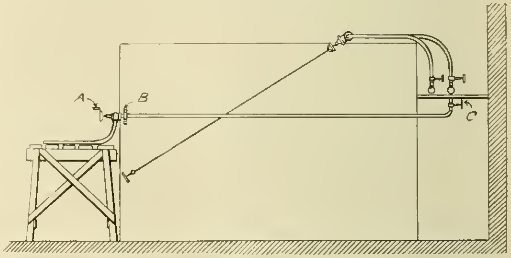


Figure 212-(E4-1).

A usual type of construction for the valve, a, is to bolt a flat bar to the hand wheel of an angle valve having a handle secured to the end of the bar and thus making a crank with increased leverage for opening and closing the valve.

The platform shown in Figure 212 is ordinarily constructed of wooden horses supporting planking, in fact, it is common practice to use such a platform in the larger plants which have many boilers and which were designed with every detail in masonry and metal carefully planned. Such a platform is a crude, unsightly, temporary device almost, if not continuously, in use and conspicuously in view. In a plant having twelve 500-horsepower boilers and cleaning these every 60 days, taking three days for a boiler, the cleaning outfit would be in use over half the time.

(To be continued.)

The Rio Grande Railroad, a narrow gauge steam line running from Brownsville, Tex., to Point Isabel, 23 miles, is to be rebuilt for standard gauge equipment. It is reported that officials of the road are now investigating the feasibility of operating by gasoline motor cars rather than by steam equipment.

The practice of stamping on the shoulder of bearings the date on which they are put into use, thus making a permanent record without the use of an elaborate card index, has been found to be very satisfactory in the shops of the Pittsburg Railways Company.

NEWS SECTION

GENERAL NEWS OF THE MONTH

PROGRAMMES FOR THE COLUMBUS CONVENTIONS.

Under date of September 22 Secretary Swenson issued Convention Bulletin No. 4 containing announcements as follows:

The many advantages of Columbus as a convention city were given consideration in Bulletin No. 2. Since this bulletin was issued June 18, we have received many favorable comments on the selection of Columbus and there is every indication that the executive committee has acted most wisely in its choice of a convention city this year. Columbus is in the center of the great interurban railway district of the central west and it is expected that the convention will be of great value to those who are interested in the interurban side of electric railways.

We desire to impress upon you once more the advisability of securing hotel accommodation immediately if you have not already done so. Address Mr. Ben H. Harmon, secretary, Columbus Board of Trade, Columbus, O., stating the number of rooms desired, whether with or without bath, number of people who will probably occupy rooms, and whether or not any ladies will be in the party. The four leading hotels are the Southern, Chittenden, Hartman and Neil. The executive committee will be at the Southern, and the Hartman will probably be the headquarters for the ladies of the convention. The Chittenden is an excellent hotel, while the Neil is possibly the best known of the Columbus hotels. In addition, there are many other hotels which are thoroughly good. All of the hotels are in the center of the city and within a short distance of the Southern. The hotel rates will be two dollars a day and upwards on the American plan and one dollar a day and upwards on the European plan. There will be no advance in the regular hotel rates during the convention week.

The American Street and Interurban Railway Manufacturers' Association is now thoroughly organized along lines similar to those of the American association. The exhibit will be larger and more comprehensive than ever before. One hundred and thirty-five different companies have already been assigned exhibit space and the total amount of floor space will be nearly double that used at the 1905 convention exhibit in Philadelphia.

Columbus is in the district governed by the Central Passenger Association. Our application for reduced rates has been officially granted by that association which has also sent formal notices to all other passenger associations. We have already received official notification of reduced rates granted by the Trunk Line Association and by the Southeastern Passenger Association. Further information relating to railroad rates will be given in a later bulletin.

All the delegates and guests of the American, Accountants', Engineering and Claim Agents' associations will register and receive badges at the association booth, which will be located at the entrance to the Exhibition Halls on the State Fair Grounds. This booth will be kept open from 9 a. m. to 6 p. m. during all days of the convention. It will be the general headquarters for the American, Accountants', Claim Agents' and Engineering associations and will serve as an information bureau concerning association matters.

The Manufacturers' association will also have a booth at the same place, which will take care of similar matters relating to the exhibitors and the members of the Manufacturers' association.

There will be a local postoffice, telephone booths and telegraph stations, located at the entrance to the Exhibition Halls, convenient to the place of registration.

The Columbus Board of Trade will have an Information Bureau located at the Southern Hotel, in charge of Mr. M. P. Nye. Those in attendance at the convention who have not been assigned definite hotel accommodations, should consult with Mr. Nye immediately upon their arrival in Columbus. All hotel assignments will be made through this bureau.

Those in charge of the entertainment features of the convention will have some announcements to make in the near future. It is expected that there will be a theater party on Wednesday evening, and that the annual banquet will be held on Thursday evening. In addition, there will be interurban trolley parties, automobile rides, golfing and a number of other forms of amusement, most of which will be especially arranged for the ladies of the convention.

The convention will be held at the Ohio State Fair Grounds where suitable halls are available, conveniently situated with respect to the exhibit of the Manufacturers' association. The meetings will begin on Monday, the 15th, and will close on Friday, the 19th of October. The convention days assigned to the various associations have been changed somewhat since the announcement made in Convention Bulletin No. 2, and will be as follows:—

Monday—Morning: Claim Agents', Engineering. Afternoon: Claim Agents', Engineering.

Tuesday—Morning: Accountants', Claim Agents', Engineering. Afternoon: Accountants', Claim Agents', Engineering.

Wednesday—Morning: American—(Joint session all associations). Afternoon: American, Accountants', Claim Agents', Engineering.

Thursday—Morning: American, Acocuntants'. Afternoon: American, Accountants'.

Friday—Morning: American. Afternoon: American.

The committee on subjects has been actively engaged on the programmes of the four associations for several months past, and there is every prospect of a convention at which will be presented a number of interesting papers which will be of great value to the member companies. Each of the four associations will have a programme which in itself will amply repay those in attendance. While the programmes of the various associations are practically complete, as shown in this bulletin, it is expected that a later bulletin will show several additional papers bearing upon subjects of more than usual interest.

A pamphlet entitled "Columbus Conventions" has just been issued by the Electric Railway Review. Copies of this interesting booklet which contains much useful information regarding the various associations and the Columbus conventions, may be had on application.

American Street and Interurban Railway Association.

WEDNESDAY, OCTOBER 17, 1906—10 A. M.

Convention Called to Order.
Address of Welcome.
President's Address.
Report of Executive Committee.
Report of Secretary and Treasurer.
Addresses by Presidents of Affiliated and Allied Asosciations.
Announcements.
New Business.

WEDNESDAY 2 P. M.

Reports of Committees.
(a) Membership.
(b) Compensation for Carrying Mail.
(c) Subjects.
(d) Car Wiring.
(e) Standardization of Equipment.
(f) Insurance.
(g) Promotion of traffic.

THURSDAY, OCTOBER 18, 1906—10 A. M.

(Interurban Meeting.)

Report of Committee on Heavy Electric Railroads.

Paper "Elevated Railways and their Bearing on Heavy Electric Traction," by H. M. Brinckerhoff, consulting engineer, New York City.

. Paper—"Electric Railways in Sparsely Settled Communities," by E. P. Roberts, of the Roberts & Abbott Company, Cleveland, Ohio.

Paper—"Interurban Limited Trains," by Harrie P. Clegg, president Dayton & Troy Electric Railway Company, Dayton, Ohio.

Paper—"Interurban Freight and Express," by E. C. Spring, general manager Dayton Covington & Piqua Traction Company, West Milton, O.

Paper—"Tickets and Rates," by F. W. Coen, secretary and treasurer Lake Shore Electric Railway Company, Cleveland, O.

Paper—"Some Distinctions between City, Suburban, Interurban and Railroad Traffic," by Theo. Stebbins, expert National Civic Federation, Cohasset, Mass.

Appointment of Nominating Committee.

THURSDAY—2 P. M.

(Employes' Meeting.)

Report of Committee on Rules.

Paper—"Y. M. C. A. Branches," by E. M. Willis, railroad secretary International Committee of Y. M. C. A., New York City.

Paper—"Selection of Trainmen," by C. E. Learned, superintendent of inspection Boston Elevated Railway Company, Boston, Mass.

Paper—"Discipline of Trainmen," by F. W. Brooks, assistant general manager Detroit United Railway, Detroit, Mich.

Paper—"Uniforms and Badges," by John R. McGivney, purchasing agent New Orleans Railway & Light Company, New Orleans, La.

FRIDAY, OCTOBER 19, 1906—10 A. M.

(Executive Session.)

Report of Committee on Municipal Ownership.

Report of Committee on Public Relations.

Paper—"Handling Public Complaints," by John A. Beeler, vice-president and general manager Denver City Tramway Company, Denver, Colo.

Paper—"Leaks Between Passenger and Treasurer," by A. H. Stanley, general superintendent Public Service Corporation of New Jersey, Newark, N. J.

FRIDAY—2 P. M.

Report of Nominating Committee.
Election of Officers.
Resolutions.
Unfinished Business.
Adjournment.

Accountants' Association.

TUESDAY, OCTOBER 16, 1906—10 A. M.

Convention Called to Order.

Address of Welcome by P. V. Burington, secretary Columbus Railway & Light Company, Columbus, O.

Address—Hon. W. Caryl Ely, president American Street and Interurban Railway Association.

Address—Prof. Bernard V. Swenson, secretary American Street and Interurban Railway Association.

Annual Address of President.
Annual Report of Executive Committee.
Annual Report of Secretary and Treasurer.
Appointment of Convention Committees.

TUESDAY—2 P. M.

Paper "The Accounting of Capital Expenditures," by P. S.

Young, comptroller Public Service Corporation of New Jersey, Newark, N. J.

Question Box.

Convention Photograph.

WEDNESDAY, OCTOBER 17, 1906—10 A. M.

Joint Meeting with American Association.

WEDNESDAY—2 P. M.

Paper—"The Use of Curves in Statistics," by A. Stuart Pratt, general auditor and treasurer Stone & Webster, Boston, Mass.

Report—Committee on Standard Classification of Accounts.

Election of Officers.

WEDNESDAY—8 P. M.

Informal Reunion and Dinner.

THURSDAY, OCTOBER 18, 1906—10 A. M. and 2 P. M.

(Executive Sessions.)

Review—"Depreciation as Applicable to Electric Railways," by Robert N. Wallis, treasurer Fitchburg & Leominster Street Railway, Fitchburg, Mass.

Discussion.

Installation of Officers.

Engineering Association.

MONDAY, OCTOBER 15, 1906—10 A. M.

Registration.

Convention Called to Order.

Address of Welcome.

Address—Hon. W. Caryl Ely, president American Street and Interurban Railway Association.

Address—Prof. Bernard V. Swenson, secretary American Street and Interurban Railway Association.

Reading of the Minutes of the Last Meeting.

Address of the President.

Annual Report of the Executive Committee.

Annual Report of the Secretary and Treasurer.

Appointment of Convention Committees.

MONDAY—2 P. M.

Report of Special Committees.

Report of Committee on Control Apparatus.

Report of Committee on Maintenance and Inspection of Electrical Equipments.

Paper—"Ballast" by Chas. H. Clark, engineer of maintenance of way Cleveland Electric Railway Company, Cleveland, O.

Report of Committee on Way Matters.

Paper—"Ties, Poles and Posts," by C. A. Alderman, chief engineer Cincinnati Traction Company, Cincinnati, O.

TUESDAY, OCTOBER 16, 1906—10 A. M.

Report of the Committee on Standardization.

Paper—"Gas Engines," by Paul Winsor, chief engineer motive power and rolling stock Boston Elevated Railway Company, Boston, Mass.

Paper—"Underground Cables," by H. G. Stott, superintendent motive power Interborough Rapid Transit Company, New York, N. Y.

TUESDAY—2 P. M.

Paper—"Economy of Car Equipment, Weights and Schedules," by E. H. Anderson, Schenectady, N. Y.

Discussion of the Question Box.

TUESDAY—8 P. M.

Informal Reunion and Dinner.

WEDNESDAY, OCTOBER 17, 1906—10 A. M.

Joint Meeting with American Association.

WEDNESDAY—2 P. M.

General Business.

Election of Officers.

Claim Agents' Association.

MONDAY, OCTOBER 15, 1906—10 A. M.

Registration and Badges at Ohio State Fair Grounds.

Secretary Davis at Fair Grounds.

President Rhoades at Southern Hotel.

MONDAY—2 P. M.

Convention Called to Order.

Address of Welcome—by B. B. Davis, claim agent Columbus Railway & Light Company, Columbus, O.

Address—Hon. W. Caryl Ely, president American Street and Interurban Railway Association.

Address—Prof. Bernard V. Swenson, secretary American Street and Interurban Railway Association.

Minutes of Last Meeting.

Address of the President.

Annual Report of Executive Committee.

Annual Report of Secretary and Treasurer.

Appointment of Convention Committees.

TUESDAY, OCTOBER 16, 1906—10 A. M.

Paper—"Which is the Better Policy, Quick or Delayed Settlements?" by A. J. Farrell, claim agent International Railway Company, Buffalo, N. Y.

Paper—"The Policy of the Claim Department Toward the Public," by W. F. Weh, Cleveland Electric Railway Company, Cleveland, O.

TUESDAY—2 P. M.

Paper—"The Claim Agent's Work of the Future," by C. Willis Hare, United Gas Improvement Company, Philadelphia, Pa.

Discussion—"The Relation of Statistical Bureaus to the Claim Agent's Work," by Russell A. Sears, C. S. S. Miller, Bayard P. Holmes and William DeMilt Hooper.

WEDNESDAY, OCTOBER 17, 1906—10 A. M.

Joint Meeting with American Association.

WEDNESDAY—2 P. M.

Paper—"Methods of Management," by H. C. Bradley, Union Traction Company, Chicago, Ill.

Question Box.

General Business.

Election of Officers.

Fall Meeting Central Electric Railway Association.

The first regular meeting of the Central Electric Railway Association after the summer recess will take the form of an outing at Robinson Park, on the line of the Ft. Wayne & Wabash Valley Traction Company at Ft. Wayne, Ind., on September 27. This meeting is to be open to the ladies. The management of the park has reserved it for that day for the exclusive use of the members and friends of the association, and has extended the courtesy of the free use of boats, bowling alley, dance hall and baseball park. A special excursion by steamers has been arranged for the ladies during the business meeting. A representative of the traction company will be at the Transfer Station, Main and Calhoun streets, to furnish members with transportation. Railroad officials desiring to attend the meeting in their private cars are assured of ample accommodations at Ft. Wayne for storing and care of the cars over night. Everyone interested in electric railway work is invited to attend.

The programme will be as follows: 10 a. m., business meeting; 11 a. m., paper by C. R. McKay, electrical engineer of the General Electric Company, on "Lightning Protection for Power Houses and Substations;" 11:30 a. m., reports of committees; 1 p. m., fried chicken dinner; 2:30 p. m., vaudeville show; 3:30 p. m., baseball game, Hoosiers versus Buckeyes; 4:30 p. m., trolley ride, visiting the new power station under construction by the Ft. Wayne & Wabash Valley Traction Company, the Bass Foundry & Machine Works, and the Ft. Wayne Electrical Works.

Cleveland Traction Situation.

The franchise controversy between the Cleveland Electric Railway Company and the Municipal Traction Company shows no signs of abatement. The Cleveland Electric seven-tickets-for-a-quarter plan and the Municipal company's three-cent fare scheme are still before the council and no definite conclusion has been reached in regard to the occupancy of Fulton road. Councilman Hitchins, who introduced the Cleveland Electric ordinance by request, early in August announced that he desired to make some changes in it before advocating it before the council and at first endeavored to compromise with the company on a basis of eight tickets for a quarter and a 20-year franchise grant instead of 25 years.

President Andrews declined to modify his original offer to that extent but agreed to draw up a new ordinance making several concessions. In the meantime the rival companies have continued their campaign of education, keeping their respective schemes prominently before the public through the medium of bill-boards and the advertising columns of the newspapers. Mayor Johnson has continually insisted that practically all of the Cleveland Electric company's franchises expire within three years and President Andrews on August 10 issued a statement attacking the validity of the Municipal Traction Company's grants and claiming that most of his company's franchises remain in force until 1914.

On August 11 Judge Lawrence of the court of common pleas, in deciding the Cleveland Electric company's suit against the city, said that the removal of the company's track on Fulton road on July 25 by the city officials was illegal because the council resolution of June 11 ordering the company to remove its tracks to the side of the street was not legally passed. The court gave the company the right to restore its tracks without being disturbed by the city or the Municipal Traction Company. On the day of the decision President Dupont of the low-fare company proposed to the Cleveland Electric company that each should lay a track in Fulton road, to be used jointly by both companies. President Andrews replied by sending a letter to the meeting of the council street railway committee on August 13 saying that his company would relocate its tracks, but would not concede any right over them to the Municipal Traction Company. The committee recommended an ordinance directing both companies to lay tracks on Fulton road and operate them jointly. This ordinance was passed by the council on August 20 but the companies have not yet reached any agreement as to terms and continue to oppose each other at every turn.

On August 13 Councilman Hitchins announced that he was in favor of an ordinance similar to that now being proposed in Detroit, of ten tickets for a quarter during the hours when workingmen are going to and from work and six tickets for a quarter at other times, with a five-cent cash fare. Other councilmen proposed new ordinances, one favoring 12 tickets for a quarter with no transfers, and another advocating that the city lease the lines of both companies, have them operated by the present management and maintained by taxes, letting everyone ride free. On August 18 Mr. Andrews and Mr. Hitchins effected a compromise and at the meeting of the council on August 20 an ordinance was introduced providing for a 20-year instead of a 25-year franchise, very liberal transfer privileges, broader rights for the city in the regulation of the operation of cars, and with a clause permitting the city to purchase the lines at the expiration of the grant. The seven-tickets-for-a-quarter clause remained unchanged. The low-fare company introduced several ordinances asking for further franchises. On August 25 the Cleveland Electric Company began relaying its tracks on Fulton road, without opposition. The Municipal company has begun negotiations for a working agreement for the use of the old company's tracks through the Public Square and around the loop.

The Cleveland Electric Company is still trying to have the council submit the two propositions to the people on one ballot. The new company has retreated from its first position in this regard and now opposes an election There is no probability of a settlement of the controversy at any early date.

On September 6 President Andrews offered to lease the company's street railway system to a holding company on a basis of a 4½ per cent return on the capital stock of $23,400,000, half the directors of the holding company to be named by the Cleveland Electric and half by the city. Mayor Johnson declared that he would never accept such an offer, but promised to present a counter proposition in a few days.

Street Railway Developments in Chicago.

On August 19 electric trolley cars began operating on the Madison street and Milwaukee avenue lines of the Chicago Union Traction Company, which had formerly been operated by cable. The passing of the cable system was marked by violence from mobs seeking souvenirs of the last cars, which approached the nature of a riot. Practically the same running time was made with the new cars as with the old because the trainmen had not had time to familiarize themselves with the new method of operation, and for the first few days blockades and breakdowns were so frequent as to cause numerous complaints on the part of the passengers and the city s officials. The service continues to improve steadily and is now much superior to the old cable service. Dr. Maurice F. Doty, city superintendent of transportation, further added to the company's troubles by instituting a large number of suits against the company for operating cars with trailers without adequate brake equipment. The suits were postponed on the promise of the company to operate motor cars singly except during rush hours as soon as sufficient equipment can be secured. Superintendent of Streets Doherty on August 21 sent a letter to both the Chicago City Railway and the Chicago Union Traction companies demanding that grooved rails be used in all streets where improvements are being made. When General Manager Roach of the latter company said that no rails of this pattern could be secured from the mills at this time Commissioner of Public Works O'Connell showed where about 200 tons could be obtained for immediate delivery and an order has been given to the Maryland Steel Company and the Pennsylvania Steel Company for all grooved rails in their possession. Rails are needed for about 15 miles of track and as improvements are being held up for lack of the new rails in several sections of the city Mr. O'Connell is endeavoring to find out from the mills if more cannot be secured.

On September 1 Doctor Doty submitted to Mayor Dunne a report showing that during the 50 days prior to August 8 there were 24 fatalities and 285 persons injured in the city by street cars. The report asked for a grand jury investigation of the accidents and suggested that ordinances be passed to further safeguard the operation of street cars. The mayor has stated that he will take action at once toward an investigation of the matter.

The opening attack on the validity of the Mueller certificate ordinance was made before Judge Windes of the appellate court on September 3 when arguments opposing the ordinance were begun and an intervening petition was filed by interests representing the traction companies. The petition has been made a part of the original bill of complaint, which asks that the Mueller ordinance, passed by the council on January 18, 1906, and the statute on which it is based be declared void and that the city and its agents be perpetually enjoined from issuing or selling the certificates on the proposed mortgage, by which the municipality hopes to obtain sufficient funds for the operation of a street railway system.

On September 5 the Chicago Street Railway Company was incorporated by representatives of the bondholders of the North and West Chicago street railway companies, with the avowed purpose of bidding in those properties should they be offered for sale by the courts at the termination of the receivership.

Brooklyn Rapid Transit 10-Cent Fare.

In the Electric Railway Review for August, 1906, page 501, there was published a statement of E. W. Winter, president of the Brooklyn Heights Railroad Company, made to the State Board of Railroad Commissioners in defense of the company's right to charge a 10-cent fare to Coney Island. In connection with this there was a statement of the facts in the so-called McFarland case. McFarland was arrested on July 24 for refusing to pay a 10-cent fare between Brooklyn and Coney Island. The arrest was not made at the instance of the Brooklyn Rapid Transit Company and the company was not a party to the case. The opinion in the McFarland case was rendered on August 11 by Justice Gaynor of the Supreme Court (trial division), who found that the defendant had been wrongly arrested, and added that the company had no right to charge a 10-cent fare. The trouble-making hoodlum element took advantage of this statement from the bench and beginning with Sunday, August 12, made disturbances over the collection of the extra fare which were so frequent and serious that the company annulled its extra or summer service to Coney Island.

The roads controlled by the Brooklyn Rapid Transit Company have always charged a 10-cent fare to Coney Island, but for some years there has been more or less agitation for a 5-cent fare. This agitation has been led by one of the yellow newspapers of New York City, which sought thereby to increase its circulation during the summer. No serious effects were felt by reason of this until the present year, when the 5-cent campaign had the active aid of the president of the Brooklyn Borough and his political allies.

The attitude of the police has been directed towards preventing breaches of the peace and in so doing they have arrested both the recalcitrant passengers and the railroad employes when, in order to effect an ejectment from the car, force sufficient to constitute an assault was used. On August 15 at a conference between J. F. Calderwood, vice-president and general manager of the railroad, and Mr. McGowan, acting mayor of New York, it was proposed that the company issue rebate checks upon the payment of the extra fare, which would entitle the holder to a refund of the money in event the Court of Appeals should decide that the company had no right to charge the 10-cent fare. This proposition was approved by the directors of the company and summer service to Coney Island was restored as soon as rebate checks could be prepared. There was no disorder on the next Sunday, the 19th.

Judge Gaynor, whose opinion of August 11 furnished the pretext for the disorder, on August 15 in an interview said: "The company was not a party in the case before me. It was a criminal case in which the Brooklyn Rapid Transit played no part. Consequently the corporation is in no wise bound by my decision. Nor can the company be forced to recognize my decision." This statement shows the injustice of the attack upon the company which has been described as the lynching of a railroad.

It has been agreed that the attorney general shall institute mandamus proceedings to get the question before the court of appeals at the earliest date practicable.

On August 24 the company made an important concession in its fares to Coney Island by adopting a zone system of collection which makes it possible for persons living south of Prospect Park or Greenwood Cemetery to go to and from Coney Island on a single fare. The plan of the company extends the 5-cent fare zone north 20 or 25 blocks beyond the legal second fare collection points. Persons en route to Coney Island who board the trains between Prospect Park or Greenwood Cemetery and the old collection points are given identification slips on payment of their fares and from those having identification slips no second fare is collected. In the opposite direction the second fare is collected after the concession territory is passed.

Indianapolis & Western Line Formally Opened.—The line of the Indianapolis & Western Traction Company, from Indianapolis to Danville, Ind., was formally opened on September 1, although cars had been operated for several days. The road was begun two years ago and will ultimately extend on to Greencastle, passing through one of the richest sections of Indiana.

Clubroom for United Railways & Electric Company.—The United Railways & Electric Company of Baltimore, Md., has leased the upper floor of the building at the corner of Howard and Franklin streets and will fit it up at once as a clubroom for employes. There will be a separate room as a meeting place for line superintendents. The usual features of an up-to-date clubroom will be installed.

Taxes Frighten Trolley Builders.—Michigan papers assert that the high rate of railroad taxation in that state is preventing eastern capitalists from providing money to construct electric lines in Michigan. It is said that the Grand Rapids-Kalamazoo and the Grand Rapids-Ionia roads, on which work has been discontinued for lack of funds have endeavored to raise the needed money in the East without success on this account.

Companies Ask Permits to Carry Freight in Massachusetts.—The Old Colony Street Railway has petitioned the Massachusetts railroad commissioners for authority to act as common carriers of baggage and freight through the towns of Raynham, Bridgewater and Middleboro. The Interstate Consolidated Street Railway has also applied for a certificate allowing it to carry freight over its lines in North Attleboro, agreeing to carry bulky freight only at night.

Magnets to Operate Switches.—E. J. Rice, Spokane, Wash., has patented a magnetic device for operating steel railway switches without stopping the car. The device consists of an electro-magnet suspended over the rail beneath the platform of the car, operated by a lever which throws it to the right or left, the attraction of the magnet opening or closing the switch. The Rice Electric Switch Company has been formed to place the device on the market.

Illinois State Electric Convention.—The annual convention of the Illinois State Electric Association will be held at Springfield, Ill., on September 19 and 20. The headquarters will be at the Leland hotel. It is believed that there will be a large attendance, and manufacturers and supply houses are invited to send representatives. Exhibits of anything of interest to members will be gladly received at this year's convention. D. Davis of Litchfield is president of the association.

Electric Cars Run to Atlantic City.—A test run was made on September 4 over the new electric line of the West Jersey & Seashore Railroad from Camden to Atlantic City, N. J. Several officials of the General Electric Company and the railroad company made the trip and reported that everything had worked smoothly. It was announced that the new schedule would go into effect on September 18. Until that time trains will be run for the purpose of giving experience to the trainmen.

Kansas City Western Power House Burned.—The power house of the Kansas City Western Railway, located at Wolcott, Kan., was completely destroyed by fire on the night of September 2. The loss is estimated at $150,000. A short circuit is said to have been the cause. The company operates the line between Kansas City and Leavenworth, as well as the Leavenworth city lines, and as a result of the fire the residents of that section were left entirely without local transportation facilities. The company has made arrangements with the Metropolitan Street Railway Company of Kansas City to supply current for operating 10 miles of the line from the Kansas City end. The absence of transformers prevents the supplying of a greater distance. The power house will be rebuilt.

"Jim Crow" Ordinance for Savannah.—Two ordinances have been introduced into the city council of Savannah, Ga., providing for the separation of the races on the street cars by designating separate seats for white and colored passengers.

Meeting of New York State Association.—The next quarterly meeting of the Street Railway Association of the State of New York will be held at Albany, N. Y., on September 19, and will take the form of a one-day conference. At the suggestion of the New York Railroad Commission the conference will be devoted to subjects pertaining to the mechanical department, and a large attendance of general managers and master mechanics is urged. The hour and place of meeting, and the list of topics, have not yet been announced.

San Francisco Strike Ended.—The strike of the conductors and motormen on the United Railroads of San Francisco, as well as of the electricians and construction workers, which has tied up practically all of the street car lines of San Francisco since August 26, was ended on September 5. The strike was declared off by the strike committee of the unions following a mass meeting on September 4, at which it was voted to return to work and have the demand for higher wages arbitrated. The 2000 strikebreakers imported by the company will be used on construction work.

Tributes to Messrs. Duffy and Mackay.—The American Street and Interurban Railway Accountants' Association has in a very happy manner marked its appreciation of the services of two past presidents of the association who have severed their connection with street railway work since the Philadelphia convention. Mr. C. N. Duffy, who as first vice-president presided over the first regular meeting of the Accountants' Association at Niagara Falls in 1897, and who served as president in 1899, and Mr. H. C. Mackay, who was president of the association in 1901, have each been presenetd with a handsome sterling silver bowl appropriately engraved.

"Tim" Healy Opposed to Government Ownership.—"Tim" Healy, the Irish member of Parliament, has expressed himself as follows in regard to government ownership: "It seems to me greater federal control is a step in the right direction. Municipal ownership works well in Glasgow and some other cities in Europe, but it does not follow that it would be successful here, where politics plays such a big part in the conduct of affairs. It seems to me it would be far better to have the tramways pay an annual rental for the use of the streets. That plan is followed in Dublin, where I believe $75,000 or $80,000 is paid each year."

Electric Roads and Block Signals.—A committee of the Railway Signal Association, of which Mr. W. H. Elliot, 335 Madison avenue, New York, is chairman, has issued a list of questions dealing with the effects of foreign current on automatic block signals. Particular attention is called to the questions, as the committee is of the opinion that this branch of the subject should be taken up with a view to bringing to the attention of the general managers the seriousness of the situation and the desirability of making the electric roads fully responsible for any interference with the working of automatic signals on steam roads.

An Exposition of Safety Devices.—The American Institute of Social Service will hold in New York City, in January, 1907, an exposition of devices of all kinds for safeguarding the lives and limbs of working men and women, and for preventing accidents under the ordinary conditions of life and labor to which the general public is exposed. Manufacturers generally, as well as organizations whose special function is to improve the conditions of labor, are to send exhibits in the nature of photographs, descriptive drawings, models, and as far as possible, the devices themselves in actual operation. Requests for information regarding space should be made to Dr. William H. Tolman, director, 287 Fourth avenue, New York.

Central Electric Railway Association.—Mr. John H. Merrill, secretary, has recently issued in pamphlet form the constitution and by-laws of the Central Electric Railway Association together with the list of officers, and also the full lists of members and officers of the old Ohio Interurban Railway Association and the Indiana Electric Railway Association, which were merged in January, 1906, to form the Central Electric Railway Association. The secretary has also mailed a circular letter to members announcing that the insignia or button of the association is ready for distribution at a special price of $1.25 each. This button is made of gold with a blue enameled border, containing in the center a picture of an interurban car, surrounded by the initials C. E. R. A. The wearing of the insignia is a neat method of advertising the interurban service, and is occasionally a medium through which advantageous acquaintanceships are formed.

Interstate Fares Reduced on Account of Ohio Two-Cent Law.—The Pennsylvania Lines have finally determined to make interstate fares across Ohio and from and to points within the state conform more closely to the sums of the locals. When the Ohio two-cent law took effect the roads agreed to make no immediate change in interstate fares, although the Pennsylvania officials expressed their belief that the disparities between through rates and the sums of the locals should be reduced or eliminated. The Vanderbilt lines have opposed any change in interstate fares until it is settled that the Ohio law is a permanent fixture in its present form. But the Pennsylvania Lines have finally taken action on their own account. The changes are now being considered and just where changes will be made and when they will be effective is not yet announced. The Ohio law is said to be working so favorably upon the earnings of the roads that there will be no ground for attacking it in the courts as confiscatory.

Work of the Committee on Standard Rules.—The committee on Standard Code of Rules of the American Street and Interurban Railway Association has mailed to the managers of street and interurban railways a circular asking for information as to the use made by the various companies of the code of rules for the government of trainmen of electric roads, which was included in the committee's report to the association at the St. Louis convention in 1904, and which was subsequently issued in pamphlet form and sent to the various street railway companies of the country. The circular information blank, which managers are requested to fill out and return to Mr. B. V. Swenson, secretary of the association, asks whether the company has adopted the standard code of rules as formulated by the committee, or its reasons for not having done so, for suggestions applicable to the rules, and whether it is considered desirable for the committee to formulate a set of rules for high-speed interurban service. The results of this investigation will form part of the committee's report to be presented at the Columbus convention.

Work on the Philadelphia Subway and Elevated.—The Philadelphia Rapid Transit Company has awarded a contract for the construction of eight passenger stations along the line of the Market Street elevated road. The stations will be constructed of steel framework, covered with sheet copper. The interior work will be of red oak. Each building will be supplied with waiting rooms for men and women, and ticket offices. The platforms will be 300 feet in length. It is the desire of the company to place the section of the subway west of City Hall and the elevated line in operation as early in November next as possible. While the elevated stations are under construction, the Smith Contracting Company will vigorously push the subway station work at Fifteenth and Market streets. This will be one of the largest underground stations in the world. It extends from the east side of Sixteenth street to City Hall on both sides of Market street, and entrances are being made from Broad street station and the Arcade building. This station will be occupied within the next 60 days. The temporary loop of the subway being made west of City Hall will be ready for use within 60 days. Until the elevated stations are completed the surface line now operating in the subway will use the temporary loop. As soon as the elevated section is opened to the public many cars will be added to the service.

Electric Freight Service Begun in Chicago Tunnels.—Underground freight service was begun in Chicago on August 15 through the tunnels of the Illinois Tunnel Company. The first consignment was from the freight sheds of the Chicago & Erie Railroad, Clark and Fourteenth streets, to the Monarch Company, across the river. The trip, two miles, was made in 16 minutes. From the same yards the next two cars started for the freight yards of the Chicago Milwaukee & St. Paul road, and two more went to the storage warehouse of Marshall Field & Company on the West Side. The former trip was made in 24 minutes and the latter in 12. At the beginning of business there were present, besides officials of the tunnel company, a number of steam railroad men interested and several city officials. About 45 miles of the tunnel is now completed, several branches extending well beyond the river on the North and West Sides. The equipment now consists of 67 electric locomotives and 400 freight trucks, and there is being built an additional complement of 15 locomotives and 250 trucks. The company has 40 receiving stations and is connected with nine regular railroads. The roads now ready for service are the Erie, Alton, Rock Island, Wabash, Santa Fe, Great Western, Monon, Baltimore & Ohio, and Chicago Milwaukee & St. Paul, and contracts have just been entered into between the tunnel company and the Chicago & Eastern Illinois and the Illinois Central.

Opening of Racine Extension, Chicago & Milwaukee Electric Railroad Company.—On Saturday, September 1, the Chicago & Milwaukee Electric Railroad Company entertained about 500 guests in honor of the opening on that day of its extension from Kenosha to Racine. Special accommodations were furnished by steam train from Chicago and Milwaukee to Waukegan where the party was assembled. From Waukegan the guests were taken over the electric line to Racine, where an elaborate dinner was served at the Dana Society hall. Several entertaining addresses were made by officials of the road and prominent citizens interested in its welfare. After the banquet the party traveled over the electric line to Ravinia Park, where they were again guests of the Chicago & Milwaukee Electric road for supper and for an evening concert given by the Thomas orchestra.

In its extensions from Lake Bluff north towards Milwaukee, which city it is expected will be reached early next year, the Chicago & Milwaukee Electric Railroad Company is building in an especially thorough manner so that the roadbed will place no restrictions on the speed at which schedules may be operated. In the 10-mile section, opened on September 1, there are few curves and none of these has a radius of less than (45 minutes) 7,639 feet. The steepest grade is .46 per cent. The right of way is 100 feet or more in width and the two tracks now in operation are placed at one side of the center line so that two more tracks may occupy the opposite side of the roadway. The bridges and the earthwork have been built to accommodate four tracks. The water-passes and the only bridge of any size, are of reinforced concrete construction. One bridge over the Pike river near Berryville is wide enough for four tracks and its arch has a span of 48 feet. The track, which is of 80-pound T-rails with continuous joints, is mounted on standard ties with gravel ballast. The line was opened with 30-minute service from 6 a. m. to 12 p. m. Current for the operation of the cars is supplied by two substations, one at Racine and one at Kenosha. These stations are of the same type and each has two 500-kilowatt rotaries and a storage battery. The Kenosha substation was described in detail in the Street Railway Review for January, 1906, page 9.

New York New Haven & Hartford Disposes of Trolley Roads.—The New York New Haven & Hartford Railroad has disposed of its holdings of electric roads in New England, which it controlled through the medium of the Consolidated Railway Company, to a voluntary association known as the New England Security & Investment Company, of Boston. This deal involves the sale of more than 75 per cent of the street railways of Connecticut, including the street railway systems of New London, New Haven, Bridgeport, Norwich, Stamford, Hartford and Willimantic, together with lines running into New York and Rhode Island and numerous lines in Massachusetts, including the city system of Springfield and Worcester, aggregating over 600 miles of road. The transaction is evidently the outcome of the agitation over the "merger bill" in the last session of the Massachusetts legislature. The New England Security & Investment Company has issued to the Consolidated Railway Company, the entire stock of which is owned by the New York New Haven & Hartford, promissory notes and its shares of capital stock, amounting to $10,000,000 preferred and $10,000,000 common in exchange for the trolley properties in Massachusetts. The Consolidated Railway Company guaranteed the preferred shares as to 4 per cent dividends and all the preferred and common shares were turned over to bankers for sale. Men prominently identified with interests of the New Haven road purchased these common shares from their personal funds and their ownership is of a purely personal nature. Thus the stock of the New England company has passed into hands of private individuals and the officers and directors of the New Haven road cannot longer be charged with permitting the company to hold stock in Massachusetts trolley railway companies.

New York Pittsburg & Chicago Air Line.—A Pittsburg paper of Aug. 14 has the following: "A new direct double track low grade railroad from New York to Chicago by way of Pittsburg, to cost about $150,000,000, will be inaugurated this week by the consolidation of three railroads in different parts of Pennsylvania. Back of the project is a syndicate of prominent foreign bankers, associated with Joseph Ramsey, Jr., former president of the Wabash railroad. Papers of consolidation will be filed at Harrisburg this week and will constitute the formal announcement. Complete surveys have been made, and it is expected that work preliminary to actual grading and construction next spring will begin this fall. It is expected that the road will require three years to construct. It is contemplated to operate with electric locomotives from the beginning. It will be known as the New York, Pittsburg & Chicago Air Line, and will be 65 miles shorter from Pittsburg to New York than is the Pennsylvania, and 108 miles shorter than the shortest line between New York and Chicago. The new air line will traverse the important bituminous coal fields of central Pennsylvania, now controlled by the Pennsylvania railroad, and also will pierce the anthracite region throughout its length. It not only will be the shortest line through Pennsylvania, but it will cross the summit of the Allegheny mountains 400 feet lower than does the Pennsylvania, and will have easy curves and remarkably low grades for a mountain line. Mr. Ramsey confirms these statements in a telegram from New York today. The cost of the line between Pittsburg and New York, Mr. Ramsey says, is estimated to be between $75,000,000 and $150,000,000, all of which has been pledged, the bulk of it by foreign capitalists. The merger papers to be filed this week will provide for the consolidation of the Indiana, Clearfield & Eastern, the Allentown, Tamaqua & Ashland, and the Brush Creek and Crows Run railroads."

Traffic on Chicago Elevated Roads.—The following table shows the average daily number of passengers carried on three of the elevated railroads of Chicago during the first eight months of the present year, as compared with 1905:

Metropolitan West Side Elevated Railway.	1906.	1905.	Inc.	Pct.
January	129,720	116,013	13,707	11.81
February	135,570	121,177	14,393	11.09
March	138,169	124,853	13,316	10.70
April	137,477	124,996	12,481	10.00
May	136,735	125,164	11,571	9.24
June	133,974	124,579	9,395	7.54
July	123,370	113,578	8,792	8.69
August	123,512	116,395	7,117	6.11
Northwestern Elevated Railroad.				
January	81,191	73,728	7,463	10.12
February	83,572	78,773	4,799	6.09
March	85,154	90,500	4,654	5.78
April	84,244	79,779	4,465	5.59
May	81,748	77,863	3,885	4.90
June	80,165	75,837	4,328	5.70
July	73,308	67,488	5,820	8.62
August	73,176	68,938	7,238	6.14
South Side Elevated Railroad.				
January	92,406	84,569	7,837	9.15
February	95,077	88,173	6,900	7.83
March	95,466	91,384	4,082	4.47
April	95,756	91,901	3,855	4.19
May	97,159	89,971	7,188	7.98
June	101,700	93,941	7,829	8.32
July	92,976	85,272	7,704	9.03
August	88,539	85,288	3,251	3.81

PERSONAL MENTION

Mr. John Finley has resigned as general manager of the Central Railway, of Peoria, Ill.

Mr. John Donnelly has resigned as master mechanic of the Toronto Railway Company, Toronto, Ont.

Mr. Austin Consor has resigned as traffic manager of the Detroit Monroe & Toledo Short Line, of Monroe, Mich.

Mr. J. Fenton has resigned as superintendent of the Springfield (Mo.) Traction Company, on account of ill health.

Mr. E. B. Johns has been appointed superintendent of transportation of the Norwich & Westerly Street Railway, Norwich, Conn.

Mr. Charles Sanderson has been appointed assistant superintendent of the Chester (Pa.) Traction Company, succeeding Mr. Edward News, resigned.

Mr. J. W. Holliday has been appointed superintendent of the Montgomery Traction Company, Montgomery, Ala., in place of Mr. C. C. Hogshead, resigned.

Mr. W. J. Ferris, assistant general manager of the Illinois Traction System, has resigned to become associated with the Chippewa Valley Electric Railway.

Mr. H. H. Gallup has been elected president of the Norwich & Westerly Street Railway, of Norwich, Conn., in place of Mr. Thomas W. Hamilton, resigned.

Mr. Daniel B. Banks has resigned as chief engineer of the United Railways & Electric Company, of Baltimore, Md., to engage in independent consulting work.

Mr. Charles R. Minton has been appointed superintendent of the Muncie & Portland Traction Company, with office at Portland, Md., succeeding Mr. J. L. Wilson, resigned.

G. W. McClure.

Mr. G. W. McClure, formerly master mechanic of the Michigan United Railways Company, at Lansing, Mich., has accepted a similar position with the Norwich & Westerly Railway, Norwich, Conn. The position made vacant by his resignation, which was effective August 1, is temporarily being filled by Mr. O. H. Shulwilt, who was formerly in the employ of the Detroit Monroe & Toledo Railway.

Several changes have been made in the traffic department of the Illinois Traction System. Mr. T. T. Thompson, district traffic agent of the St. Louis & Springfield Railway and the Illinois Central Traction Company, will hereafter have jurisdiction only over the St. Louis & Springfield, from Springfield to Staunton, with office at Springfield. Mr. S. K. Holland has been appointed district traffic agent of the Illinois Central Traction Company, with office at Springfield, with jurisdiction between Springfield and Decatur. Mr. S. H. Johns has been appointed district traffic agent of the Chicago Bloomington & Decatur Railway, with office at Decatur, succeeding Mr. P. J. Brillery, who has been appointed city superintendent at Decatur.

Mr. John B. Rogers has resigned as chief engineer of the Ocean Shore Railway, of San Francisco, Cal., to accept a position with the United Railways Company, of Portland, Ore.

Mr. C. E. Mandeville has resigned as superintendent of the Fort Smith (Ark.) Light & Traction Company to accept a position as general manager of the Central of Arkansas Railroad.

Mr. E. P. Spears, of Dallas, Tex., has been elected president of the Oklahoma City Lexington & Sulphur Springs Electric Railway, with office at Lexington, Okla., succeeding Mr. Jay Sherman.

Mr. Harry Fraser, of Fremont, O., has been appointed to the newly created position of trainmaster of the Lake Shore Electric Railway. He will have general supervision of the train dispatchers.

Mr. John N. Akaman, general passenger agent of the Public Service Corporation of New Jersey, has been appointed general superintendent of the South Jersey division of that company, with headquarters at Camden.

Mr. Burt C. Bradley, heretofore acting superintendent of the Corning & Painted Post Street Railway, Corning, N. Y., has been appointed superintendent, in place of Mr. John C. Wilcox, who has resigned on account of ill health.

Mr. C. O. Vandeventer, heretofore division engineer of the South & Western Railway, has been appointed chief engineer of the United Railways & Electric Company, of Baltimore, Md., succeeding Mr. Daniel B. Banks, resigned.

Mr. H. C. Reagan, who has been superintending the erection and installation of electrical and steam machinery and substations of the Pittsburg & Butler Street Railway, has been appointed electrical engineer of that company, in charge of power stations and car equipment. Mr. Reagan was the constructing engineer for the

Appleyard lines, and was at one time chief engineer of the Cleveland Painesville & Ashtabula Railroad.

Mr. G. J. Chester, chief electrician of the Illinois Traction System, has had his headquarters removed from Springfield to Decatur, Ill.

Mr. William Artingstall has been appointed principal assistant engineer of the Chicago Union Traction Company, in charge of lowering the La Salle, Washington and Van Buren street tunnels. Office, 89 West Washington street, Chicago.

Mr. H. S. Crocker has resigned as manager of the western division erecting department of the American Bridge Company, to accept a position as bridge engineer of the Denver City Tramway Company, with headquarters at Denver, Colo.

Mr. John B. Rogers, of San Francisco, has been elected vice-president of the United Railways of Portland, Ore., in place of Mr. W. D. Larrabee, resigned. Mr. W. L. Benham, who was recently elected president, to succeed Mr. J. Whyte Evans, has resigned.

Mr. Frank R. Phillips, heretofore master mechanic of the Cincinnati Newport & Covington Light & Traction Company, with office at Newport, Ky., has been appointed chief engineer of the Michigan United Railways, with headquarters at Lansing, Mich.

Mr. George Chambers, heretofore real estate and tax agent of the International Railway, of Buffalo, N. Y., has been appointed general agent, in charge of freight and passenger departments, succeeding Mr. J. E. Stephenson, resigned on account of ill-health.

Mr. William Darbie, formerly assistant general superintendent of the Connecticut Railway & Lighting Company, of Bridgeport, Conn., has been appointed general manager of the Albany & Hudson Railroad, Hudson, N. Y., succeeding Mr. George G. Blakeslee, resigned.

Mr. Robert Dittenhaver, of Toledo, formerly passenger and freight agent of the Toledo & Indiana Railway, has been appointed auditor of the Ohio Central Traction Company, with office at Galion, O., succeeding Mr. A. T. Long, resigned on account of ill-health.

Mr. Frank H. Wampler, heretofore master mechanic of the Philadelphia Rapid Transit Company in charge of the Kensington avenue shops, has been appointed master mechanic of the Cincinnati Newport & Covington Light & Traction Company, with headquarters at Covington, Ky.

Mr. W. R. Dunham, Jr., of Providence, R. I., has been appointed assistant engineer of the Consolidated Railway Company, of New Haven, Conn., with supervision over the reconstruction and maintenance in the territory east of New Haven as far as Worcester and north of New Haven to Springfield.

Mr. A. W. Jordan, heretofore division passenger and freight agent of the Indiana Columbus & Eastern Traction Company, has been appointed acting general passenger and freight agent, in place of Mr. Walter Hurd, resigned. His jurisdiction includes all of the Schoepf syndicate's lines in Ohio except the Lima & Toledo Traction Company. Mr. Jordan's headquarters will be at Columbus, O.

Mr. W. W. S. Butler, heretofore superintendent of the Grand Rapids Railway, Grand Rapids, Mich., has been appointed general manager of the Newport News & Old Point Railway & Electric Company, Hampton, Va., which controls the Citizens' Railway Light & Power Company, of Newport News, and the Norfolk & Atlantic Terminal Company, of Hampton. Mr. Butler succeeds Mr. H. H. Carr, resigned.

Mr. Norman McD. Crawford, heretofore consulting engineer of the Consolidated Railway Company, with office at Hartford, Conn., has been elected vice-president of the Indiana Columbus & Eastern Traction Company. Mr. Crawford has been identified with the street railways of Hartford since 1892 and for some time previous to 1906, when he resigned to go to the Consolidated Railway, was general manager of the Hartford Street Railway Company.

Mr. George C. Blakeslee on September 1 resigned his position as general manager of the Albany & Hudson Railroad, Hudson, N. Y., after having been connected with that road for about seven years, part of the time as vice-president. His successor, Mr. William Darbee, formerly assistant general superintendent of the Connecticut Railway & Lighting Company, Bridgeport, Conn., has been the gas expert of the New York State Commission of Gas & Electricity, and is a graduate of Stevens Polytechnic Institute. Mr. Blakeslee will take a vacation before resuming active work.

Obituary.

J. Manchester Haynes, president of the Augusta Winthrop & Gardner Railway, of Augusta, Me., died on September 1, after a long illness.

Robert L. Kelly, chief engineer of the Florence Electric Street Railway, Florence, Colo., was killed by lightning, near Raton, N. M., on July 24.

Osian F. Paxton, general counsel of the Portland Railway Light & Power Company, and former president of the Portland Railway Company, died on August 8 at Portland, Ore. Mr. Paxton was born in Albany, N. Y., in 1858 and became connected with the Portland street railways in 1894 when he was appointed receiver for the Portland Consolidated Railway. From 1896 to 1904 he was president of the Portland Railways, since which he has continued as general counsel for the company and its successor, the Portland Railway Light & Power Company.

CONSTRUCTION

TRACK AND ROADWAY.

Bay County Railway (Napa, Cal.)—Preliminary steps are reported to be under way for the construction of a road from Napa to San Francisco, 45 miles.

Bellaire Southwestern Traction Company.—Grading has been started on this company's line from Bellaire to Shadyside, W. Va., which will be two miles long. The line is estimated to cost $60,000 and will be completed by January, 1907. G. O. Nagle, president and general manager, Wheeling, W. Va.

Beloit (Wis.) Traction Company.—This company has let a contract to the Rock River Construction Company, of Chicago, for the building of the local street railway system.

Big Bend Transit Company.—A. W. Turner, Davenport, Wash., has announced that the line from Spokane to the Big Bend country will be in operation by next year. Ten miles of grade is ready for steel and surveying parties are working toward the Columbia river.

Boone Webster City & Fort Dodge Interurban Railway.—The civil engineering firm of Budd & Maughmer has put a corps of surveyors in the field north of Boone to locate this line, which is to extend from Webster City to Boone, Ia.

Boston Lowell & Lawrence Electric Railroad.—This company has petitioned the Massachusetts railroad commissioners for a certificate of public convenience and necessity for the proposed road from Boston to Lowell, Mass., passing through Somerville, Medford, Arlington, Lexington, Woburn, Bedford, Billerica, Tewksbury, and Burlington. The road is to be double track, 22.75 miles long. Directors: Butler Ames, Paul Butler, Spencer Borden, Jr., Oakes Ames and Charles E. Remington, Boston.

Chicago & Milwaukee Electric Railroad.—The extension of the line from Kenosha to Racine, 10 miles, was formerly opened on September 1. The road is now in operation from Evanston to Racine, 50 miles.

Chicago & Southern Traction Company.—Work on the line to connect Chicago and Kankakee, Ill., is progressing rapidly, and it is expected to have it in operation by November. Several carloads of rails have been unloaded at Monee and Peotone. The ties have been on the ground for several months and the bridges and culverts are already built.

Cleveland & Southwestern Traction Company.—There are now over 150 teams engaged in grading the new line which this company is building between Mansfield, Ashland and Seville, O. Work on the culverts has started and the timber to build the trestles has been ordered. General Manager Bicknell, of the Cleveland Construction Company, says that he will have that portion of the road between Mansfield and Ashland in operation by January 1. The entire line is expected to be in operation by June 1 of next year.

Coeur d'Alene & Spokane Railway.—This company's extension from Coeur d'Alene to Hayden Lake, Idaho, was opened for traffic on August 15, and four trains a day were run from each end, connecting at Coeur d'Alene with cars for Spokane, Wash. There are four new stations on the line, Woodlawn, Johnson, Dalton and Monaghan. R. F. Blackwell, general manager, Coeur d'Alene.

Colorado & Southern Railway.—This steam road, which is preparing to run electric trains on a second track of its main line from Denver to Boulder, Colo., has made arrangements with the Denver City Tramway Company to operate its electric cars over the latter's tracks into the center of Denver. A contract for electric power has been signed with the Northern Power & Light Company, and the work of electrification will be started as soon as work on that company's power plant at Lafayette is begun.

Dayton Street Railway.—This company was recently incorporated to construct an electric line in Dayton, O., from the south corporation line on Main street to the intersection of the Salem pike and Fairview avenue. Charles H. Besler, one of the incorporators, states that the plans of the company are to build an extension of the Cincinnati Dayton & Toledo Traction Company to the headquarters of the National Cash Register Company.

Du Quoin Rapid Transit Company.—H. E. Ross, president, writes that this company, recently incorporated, will build a line from Du Quoin to Pinckneyville, Ill., 11 miles, with a branch 3½ miles long east to the mines. The route is being surveyed and grading will begin soon. The Imperial Construction Company has the contract. D. R. Archer, secretary; J. H. Ward, treasurer; both of Du Quoin, the headquarters of the company.

Hamilton Ancaster & Brantford Electric Railway.—A contract has been let to Nicholson Riley & Co., of St. Catharines, Ont., for the construction of this road from Hamilton to Ancaster, Ont., and to F. H. Dickinson for the work between Ancaster and Brantford, Ont.

Houghton County Street Railway (Hancock, Mich.).—This company has started work on the extension of its line through East Houghton, Mich. James J. Byers & Co., of Houghton, has the contract.

Illinois Traction System.—Practically all the grading between Monticello and Champaign, on the line from Decatur to Champaign, has been completed and it is expected to begin tracklaying on that section at an early date. General Manager L. E. Fischer is quoted as saying that the line from Bloomington to Peoria should be finished by the middle of November.

Indianapolis & Western Traction Company.—This company's line from Indianapolis to Danville, Ind., was opened for traffic on September 1, and a three-hour service has been inaugurated. The run is made in one hour.

Johnstown Ebensburg & Northern Railway.—W. E. Hildebrand, general manager, Johnstown, Pa., writes that this company proposes to build an electric line 30 miles long from Johnstown to Ebensburg and that it is the intention to begin construction within 90 days. George E. Daniels, president, Johnstown, Pa.; J. H. Milholland, chief engineer, Pittsburg, Pa.

Missouri Interurban Railroad.—An official statement from C. W. Thomas, Jefferson City, Mo., says that this road has been surveyed from Sedalia to Jefferson City, Mo., 80 miles, via Southton, Otterville, Saleville, Princeton, Prairie Home, California and Centertown. Contracts for the construction are to be let about October 1. J. W. Mellor, Sedalia, chairman of the board; H. B. Colby, St. John, chief engineer.

New York Auburn & Lansing Electric Railway.—This company has issued bonds to secure funds for the construction of its proposed electric road from Auburn, N. Y., south through Fleming, Scipio, Venice, Genoa and Lansing to Ithaca, N. Y., 34.6 miles. The line is to be built for high speed and will be laid with 75-pound rails. A contract for power has been made with the Niagara Lockport & Ontario Power Company.

Norfolk & Washington Air Line Railway.—This company has contracted with D. E. Baxter & Co., New York, for the construction and equipment of a line from Washington, D. C., to Esperanza, Md., 64 miles. The entire line will be laid with 70-pound A. S. C. E. rails and standard ties. President, A. B. Linderman; solicitor, Frank M. Urigman, both of Philadelphia, Pa.

Northern Electric Railway.—H. T. Ramsdell, president, Buffalo, N. Y., writes that construction work on this road from Buffalo to Niagara Falls, N. Y., will not begin until next year. The company is controlled by the International Railway Company of Buffalo, and will give the company a four-track road to the Falls.

Oakland Traction Consolidated.—Work will be started soon on the reconstruction of the 15-mile narrow gauge electric railway from Oakland to Hayward, Cal. The road will be double tracked and converted to standard gauge. E. M. Boggs, civil engineer, Oakland, Cal.

Omaha & Council Bluffs Street Railway.—The suburban extension of this road to Bellevue and Fort Crook is progressing rapidly. The tracks have been laid from Omaha to a point about half way to Bellevue and all the rails are on hand. W. A. Smith, general manager, Omaha, Neb.

Omaha Lincoln & Beatrice Railway.—This company operated the first car service over its new line out of Lincoln, Neb., on August 25, when cars were run from Fourteenth and O streets in Lincoln to Bethany. E. C. Hurd, general manager, Lincoln, Neb.

Rochester Syracuse & Eastern Railroad.—The Lawler Brothers Construction Company, of New York, has the contract for building Section 8 of this line from Savannah to Port Byron, N. Y.

San Francisco Vallejo & Napa Valley Railroad.—Martin Brady, of San Francisco, has been awarded the contract for grading this road from Vallejo to Calistoga, Cal. W. F. Botsford, of Los Angeles, is president.

Shreveport Traction Company.—This company will build a three-mile extension from Shreveport, La., to the State Fair Grounds. L. M. Levinson, general manager, Shreveport.

Spokane Cheney & Southern Electric Railroad.—Charles P. Lund, an officer of this company, announces that construction work will begin early in September on the line between Spokane and Cheney, Wash., 19 miles. The tracks of the Washington Water Power Company will be used between Spokane and Hayford, 9 miles.

Springfield & Northeastern Traction Company.—Work on this line from Springfield to Bloomington, Ill., a part of the Illinois Traction System, is progressing rapidly. Track is laid as far as Ridgely and the work of erecting poles has been started.

Stafford & Rockville Electric Railway.—The contract for building this line has been awarded by the Consolidated Railway Company, of New Haven, Conn., to Fred T. Ley & Co., of Boston, Mass. The first lot of 8,000 ties must be delivered before September 1.

St. Louis & Southeastern Railway.—James G. Jennings, chief engineer, writes that grading is to begin within 60 days on this line, which will extend from St. Louis to Cape Girardeau, Mo., 135 miles, through Hillsboro, De Soto, E. Bonne Terre, Flat River, and St. Genevieve. Surveys are in progress from De Soto to Cape Girardeau, with 26 miles, from De Soto to Flat River, completed. Contracts are to be let at once for grading from De Soto to Flat River. The road is to be single track, laid with 60-pound rails, with a maximum grade of 3 per cent. Officers: O. M. Munroe, president; J. F. Walther, treasurer; both of De Soto, where the headquarters of the company are located.

Spokane-Pend d'Oreille Rapid Transit Company.—Surveys have been made and right of way secured for two extensions to the main line, from Rathdrum to Spirit Lake, 12 miles, and from Moab to Newman Lake and for two miles along the lake shore, 5 miles. The main line extends from Spokane, Wash., to Lake Pend d' Oreille, Idaho.

POWER HOUSES AND SUBSTATIONS.

Alabama City Gadsden & Attalla Railway.—This company has awarded a contract for the construction of a steel building in Gadsden, Ala., 100x50 feet in floor area, to be used as a power house. It is to be completed in nine weeks. A contract has also been awarded for a 100x50-foot steel car barn. Both buildings are to be entirely fireproof.

Des Moines City Railway.—E. Sargent, of Chicago, has prepared plans and specifications for a central power house for this company on East Fourth street, Des Moines, to cost about $200,000. The new plant will be located adjacent to the present power house and will supply additional power needed for extensions to the present lines.

Inland Empire Railway (Spokane, Wash.)—This company has begun preliminary work on its new power plant to be installed at Nine Mile bridge, 12 miles north of Spokane. The plant will cost $850,000 and will have a capacity of 10,000 horsepower, with facilities for increasing the capacity to 20,000 horsepower. Sanderson & Porter, of New York, have been engaged as designing and constructing engineers, and William F. Zimmerman will have direct supervision of the power development. Blasting has begun and it is expected to have the plant in operation in 12 months.

Lake Shore Electric Railway.—This company is planning to install a 2,000-kilowatt turbine and additional boiler equipment in its power station at Fremont, O. The additional equipment is to supply power for the new Sandusky Fremont & Southern line which the company is making preparations to build.

Memphis Street Railway.—This company has secured a permit to erect a new power house at Broadway and Davie avenues, Memphis, Tenn. The structure is to cost over $40,000 and will be of steel fireproof construction. The Selden-Breck Construction Company, of St. Louis and Memphis, are the contractors.

Muskogee Electric Traction Company.—This company is planning extensive improvements at Muskogee, I. T., including a power plant to cost $75,000, and a $2,500 car barn, 50x134 feet in floor area. R. D. Long, electrical engineer.

Terre Haute Traction & Light Company.—This company has decided to begin work at once to enlarge the Water street power house in Terre Haute by the addition of a new 1,500-kilowatt turbo-generator, and to build a new substation at Brazil.

SHOPS AND SHOP EQUIPMENT.

Indiana Union Traction Company.—A contract has been let to H. L. Duncan, architect, of Anderson, Ind., for the plans of the proposed shops and car barns to be erected in North Anderson at a cost of $100,000. The main shop building will be 480 feet long and 80 feet wide, one-half of it two stories high. A wing from the main building will be 324 feet long and 80 feet wide. It is also proposed to build a car barn 350 feet long and 80 feet wide. The buildings will be of steel, brick and cement and as nearly fireproof as possible, and all will be steam heated and lighted by electricity.

Lake Shore Electric Railway.—It is reported that this company contemplates the erection of extensive repair shops at Norwalk, O., where cars may be rebuilt and repaired. It is also stated that next year the company will expend about $75,000 in an addition to the power house at Fremont.

Lewiston Brunswick & Bath Street Railway.—This company is planning to rebuild and considerably enlarge its car barns at Lewiston, Me., and has made negotiations for the purchase of additional land for that purpose.

Little Rock Railway & Electric Company.—This company has begun work on extensive improvements to its car barn and shops, at North and Chester streets, Little Rock, Ark. New concrete pits are to be built under the tracks, a woodworking shop established, and new machinery for repairs will be installed in the machine shop, including an electric crane.

Memphis Street Railway.—This company will soon begin work on its new car barn located near the old one, in Memphis, Tenn. The building is estimated to cost $100,000.

Philadelphia Rapid Transit Company.—This company is reported to have taken an option on a tract of land near Eddystone, Pa., on which it is proposed to build car repairs shops and extensive car barns.

Southwest Missouri Railroad.—This company has recently broken ground north of Joplin, Mo., for its new car barns, which will occupy a ground space of 64x220 feet. The building will be of concrete, in the Spanish Mission style of architecture, and will present a very handsome appearance. The barn will contain eight tracks, all with inspection pits underneath. E. J. Pratt, electrical and mechanical engineer, Webb City, Mo.

United Railways & Electric Company (Baltimore, Md.)—This company has purchased a 6-acre site for its new car barns and shops opposite Electric Park, on Belvidere avenue, between Reistertown road and Park Heights avenue. The company has abandoned its plan of building on the site recently purchased on Twelfth street on account of opposition of neighboring property holders.

Washington Water Power Company.—This company is building a 180x580 foot car barn at Spokane, Wash. The building will contain a repair shop.

FRANCHISES.

Atlanta, Ga.—The Atlanta & Carolina Railway, which has been incorporated to build a line across the state, has applied for a franchise for a line through this city on Rawson, Pulliam, Garnett, Madison and Alabama streets.

Bloomington, Ill.—A franchise has been granted to the Bloomington & Normal Railway Electric & Heating Company to lay double tracks on Main and Front streets. The company has accepted the ordinance and will at once begin work.

Cleveland Heights, O.—A 25-year franchise has been granted the Cleveland Electric Railway to operate its cars through the village. The company will begin work immediately and will build about three miles of double track with center pole construction, as an extension of the Cedar avenue line.

Conemaugh, Pa.—The Johnstown Ebensburg & Northern Railway, which proposes to build a line from Johnstown to Ebensburg, Pa., has applied for a franchise through Conemaugh. The Conemaugh Valley Railroad has also applied for a franchise.

Elkhart, Mich.—A franchise has been granted to the Elkhart Three Rivers & Kalamazoo Railway. Right of way has been secured from Three Rivers to Elkhart, Mich., and for most of the way from Three Rivers to Kalamazoo. John M. Caulfield, of South Bend, Ind., is interested.

Hillsboro, Mo.—The Jefferson County Commissioners have granted a franchise to the Hillsboro Kimmswick & Northern Railway from Hillsboro to Kimmswick and north to the county line. A franchise for a line from De Soto to Flat River was granted to the St. Louis & Southeastern Railway. The St. Louis Hillsboro & Southern Railway secured a franchise for a road from St. Louis to Hillsboro.

Milton, Ore.—The city council has granted a franchise to the Walla Walla Valley Traction Company for a line on Main and other streets. Construction must be completed within six months. A franchise was also granted to the Columbia & Walla Walla Traction Company for a line on Main and other streets, to be completed within three years.

Newark, N. Y.—A franchise has been granted to the Geneva Phelps & Newark Railroad.

North Milwaukee, Wis.—The village board of North Milwaukee has granted a franchise to the Milwaukee Electric Railway & Light Company to lay tracks on Thirty-second street.

Oklahoma City, Okla.—The Newkirk Tonkawa & Southern Electric Railway has applied for a franchise to extend its line down Hudson street through this city.

Ottawa, Ill.—A franchise has been granted to the Peoria Streator & Ottawa Electric Railway.

Owosso, Mich.—A 30-year franchise to operate a street railway system within the city has been granted to J. A. Thick, of Detroit. The council passed the ordinance over the mayor's veto.

Redwood City, Cal.—William H. H. Hart, who is promoting an electric line from Pacific Grove to San Francisco, Cal., has applied for a franchise through Redwood City. Right of way has been secured from Palo Alto to Redwood City and thence to San Mateo.

Salt Lake City, Utah.—A franchise has been granted to the Utah Light & Railway Company to build a double-track line on Second West street from a point opposite the Warm Springs, where the present line ends, northwesterly on what is known as the County road to Ninth North street. The franchise is to go into effect at once and will be in force for a period of 49 years from July 1, 1906.

San Francisco, Cal.—A permit has been granted to the Presidio & Ferries Railroad to convert all of its present cable lines to trolley lines, where the grades will permit such a change.

Seattle, Wash.—The Seattle Electric Company has been granted a franchise for an electric line on Spokane avenue from the city limits to Fauntleroy Park and on California street to the West Seattle city limits.

Spokane, Wash.—The city council has passed an ordinance granting a franchise to the Spokane-Pend d' Oreille Rapid Transit Company, which proposes to build from Spokane to Lake Pend d' Oreille, Idaho.

Streator, Ill.—A 50-year franchise has been granted to the Peoria Streator & Ottawa Electric Railway, a part of the Illinois Traction System, which proposes to build from Peoria to Ottawa, Ill., 60 miles. The ordinance provides that the road shall be in operation from Streator to Ottawa by October 1, 1908.

Tacoma, Wash.—The Pacific Traction Company has applied for three franchises for lines in the city paralleling the present lines of the Tacoma Railway & Power Company, and covering several streets running through the most thickly populated sections of the city.

Vincennes, Ind.—The Indianapolis Vincennes & Evansville Traction Company has been granted a franchise through the city. The company agrees to begin work by September 1 and to have the road in operation by December 1, 1907.

Washington, D. C.—The Washington Alexandria & Mt. Vernon Railway has applied for a franchise on Cameron street from Payne street west.

FINANCIAL

Coney Island & Brooklyn Railroad.—The statement for the year ended June 30, 1906, shows gross earnings as $460,039, expenses $299,730, and surplus $81,785, compared with gross earnings $433,800, expenses $292,074, and surplus $85,549 for 1905.

Evansville Princeton & Vincennes Interurban Railway.—The following directors have been elected: H. W. Marshall, W. V. Stuart, C. M. Murdock, William Wallace, Lafayette, Ind.; R. I. Todd, Indianapolis; J. S. Heston, P. S. Armstrong, Princeton, Ind. The directors elected the following officers: President, H. W. Marshall; vice-president, R. I. Todd; secretary, W. V. Stuart; treasurer, C. M. Murdock.

Illinois Traction System.—The Bloomington Clinton & Decatur Traction Company has certified to the secretary of state the removal of its offices from Springfield to Decatur, Ill., and the change of its name to the Springfield & Eastern Railway Company. The St. Louis & Springfield Railway Company increased its capital stock from $500,000 to $575,000.

International Railway (Buffalo, N. Y.)—The report for the year ending June 30, 1906, shows gross earnings of $4,093,912, against $3,694,339 for 1905. The surplus increased from $187,595 in 1905 to $190,127 for 1906.

Kansas City Railway & Light Company.—The report for the fiscal year ending May 31 shows gross earnings of the railway department for the year as $4,454,286, against $3,906,757 for 1905, and net earnings as $2,124,602, an increase over the previous year of 12.63 per cent. Operating expenses were 52.30 per cent of gross earnings. The track mileage between termini was 113 miles. The company earned 4.6 per cent on the common stock.

Louisville & Eastern Railroad (Louisville, Ky.)—The directors have elected the following officers: President, F. M. Fauvre, of Indianapolis, in place of H. H. Bechtel; vice-president and general manager, Percival Moore, Louisville; treasurer, C. E. Elliott, Indianapolis; secretary, H. M. Bullitt, Louisville. It was announced that the Lagrange extension would be completed by October 1 and that then the extension to Frankfort would be pushed. The entire right of way to Frankfort has been secured.

Metropolitan West Side Elevated Railway (Chicago, Ill.).—The annual report of the year ended June 30, 1906, shows earnings of 4.11 per cent on $8,708,000 of preferred stock outstanding, compared with 2.6 per cent the previous year. Operating expenses were $1,208,288, compared with $1,112,738 for 1905, while net earnings were $1,321,991, compared with $1,112,232 for 1905.

Newtown Electric Street Railway (Newtown, Pa.)—This road, operating between Newtown and Doylestown, Pa., was sold under foreclosure on August 10 to H. E. Woodman for $1,010.

New York New Haven & Hartford Railroad.—This company has disposed of its holdings in electric roads in New England, controlled through the medium of the Consolidated Railway Company, to a voluntary association to be known as the New England Security & Investment Company, of Boston, Mass. According to a statement credited to President Mellen this deal involves the sale of more than 75 per cent of the street railways of Connecticut, including the street railway systems of New London, New Haven, Bridgeport, Norwich, Stamford, Hartford and Willimantic, together with lines running into New York and Rhode Island and numerous lines in Massachusetts, including the city systems of Springfield and Worcester, aggregating over 600 miles of road. This transaction is evidently the outcome of the agitation over the "merger bill" in the last session of the Massachusetts legislature.

Northwestern Elevated Railroad (Chicago).—This company has filed notice of an increase of capital stock from $25,000,000 to $28,000,000. The company proposes to issue bonds for building the Ravenswood extension and other improvements, and the new issue is to provide for the conversion of the bonds into preferred stock later on.

Philadelphia Company (Pittsburg, Pa.)—The directors have decided to issue at once $3,240,000 of the $6,000,000 new common stock authorized on August 14. Each stockholder is given an opportunity to subscribe for the new stock at par to the amount of 9 per cent of his holdings as of record September 5.

Sandusky Fremont & Southern Railway.—This company, incorporated to build an extension of the Lake Shore Electric Railway, has increased its capital stock from $10,000 to $2,000,000.

Toledo Ann Arbor & Detroit Electric Railroad.—Judge Lockwood, of Adrian, Mich., has appointed R. H. Burgoon, of Fremont, O., and Willis Baldwin, of Monroe, Mich., receivers of this company, as the result of efforts on the part of Gorman Brothers, of Toledo, to foreclose a mechanic's lien of $17,000 on a power house they had partly completed. The finances of the company appear to be in a rather confused condition. The road has been graded from Toledo to Ann Arbor and 23 miles of track have been laid.

Toronto Street Railway.—The earnings for the year ending July 31, 1906, were $265,911, as against $237,470 in 1905. The increase in net earnings for the year was $26,421.

Union Traction Company (Santa Cruz, Cal.)—This company is now controlled by the Coast Counties Light & Power Company, and has elected new officers as follows: President, John Martin, San Francisco; vice-president, Van E. Britton, Santa Cruz; secretary, C. E. Malloch, San Francisco.

RECENT INCORPORATIONS.

Atlanta & Carolina Railway.—Incorporated in Georgia to build a railroad, 170 miles long, from Atlanta, Ga., in two directions, northeast through Fulton, DeKalb, Rockdale, Gwinnett and Jackson counties, and southwest through Campbell, Coweta, Troup and Heard counties to the Alabama state line. Capital stock, $50,000. Incorporators: M. T. Edgerton, M. Mason, W. E. Words, of Fulton county; J. R. Hosch, Henry Braselton, L. F. Sill, of Jackson county; A. J. Almand, E. A. Kimmell, Jr., T. J. Flake, of De Kalb county; and R. W. Tucker, of Rockdale county.

Belleville & Pinckneyville Traction Company.—Incorporated in Illinois to build an electric line from Belleville to Pinckneyville, Ill. Capital stock $100,000. Incorporators: L. T. Turner, John A. Hamilton, William Stevenson, T. P. Armstrong and George F. Mead.

Boone Webster City & Fort Dodge Interurban Railway. Incorporated in Iowa to build a railway between Webster City and Boone, Ia., connecting with the Fort Dodge Des Moines & Southern, now under construction. Capital stock $500,000. Incorporators: John C. Regan and D. E. Regan, of the Regan Construction Company of Des Moines; E. E. Hughes, John S. Crooks, J. H. Herman, M. J. Reilly, T. L. Jones and John C. Goeppinger, of Boone; and Frank A. Sackett, of Webster City. Officers: President, E. E. Hughes; vice-president, John C. Regan; secretary, John S. Crooks; treasurer, J. H. Herman.

Cincinnati Columbus & Toledo Railway.—Incorporated in Ohio to build a road connecting Cincinnati and Toledo, via Columbus, passing through the counties of Hamilton, Clermont, Brown, Hyland, Clinton, Fayette, Madison, Pickaway, Franklin, Delaware, Marion, Wyandotte, Seneca, Sandusky, Wood, Hancock, Ottawa and Lucas. Capital stock, $10,000. Incorporators: Richard C. Swing, H. G. Gibson, Harry E. Frost, H. H. Hoffman and C. B. Matthews, of Cincinnati, O. This is a project of the Cincinnati & Columbus Traction Company, which connects Cincinnati and Hillsboro.

Citizens' Railway & Light Company (Fort Worth, Tex.)—Incorporated in Texas to consolidate the Fort Worth & Arlington Heights Traction Company, the Fort Worth & Rosen Heights Street Railway and the Citizens' Light & Power Company, all of Fort Worth. Capital stock, $1,000,000. Incorporators: Warren Bicknell, John F. Harper, J. R. Nutt and E. W. Christy, Cleveland, O.; W. O. Allen, Fostoria, O.; Carey B. Close, Toledo, O.; George E. White, Sam Rosen and C. E. Montgomery, Fort Worth, Tex. The company will build several extensions of the present lines.

Cooperstown & Northern Railway.—Incorporated in New York to build a line from Cooperstown to Springfield and East Springfield, N. Y. Capital stock, $240,000. Incorporators: Sheldon A. Young, East Springfield; Fred J. Maxted and Charles A. Standard, of Springfield Center.

East St. Louis Columbia & Waterloo Railway.—Incorporated in Illinois to build a line from East St. Louis to Waterloo, Ill. Capital stock $10,000. Incorporators: Joseph W. Rickert, J. J. Koenigsmark, Waterloo; J. W. Warhock, E. F. Schoening, H. Reichenbach, Columbia, Ill. Headquarters, Columbia.

Evansville & Cannelton Traction Company.—Incorporated in Indiana to build an electric road connecting the cities of Evansville, Till City, Rockport, and Cannelton, Ind. Capital stock $10,500. Incorporators: F. W. Cook, George A. Cunningham, Charles C. Tennis, C. H. Battin, Gus Mulhauseny, M. S. Sonntag and M. B. Harper.

Iowa Missouri Traction & Power Company.—Incorporated in Iowa to develop water power on the Des Moines river near Keosauqua, Ia., and to build an electric railway from Keosauqua to Fairfield, Ia. Capital stock $10,000. Officers: S. H. Bauman, president, Birmingham, Ia.; G. W. Bell, vice-president, Milton, Ia.; H. E. Duckworth, secretary, Keosauqua, Ia.; J. W. Young, treasurer, Birmingham, Ia.

Lafayette & Hoopeston Interurban Railway.—Incorporated in Indiana to build a line connecting Lafayette and Hoopestown, Ind. Capital stock, $10,000. Directors: Isaac E. Switzer, William Walsh, Elmer Hawkins, Lawrence Burns, John H. Bankson, Daniel E. Harrington, Ward A. Smith, Henry A. Miller, William Randall and Edward L. Zeis. Office, Otterbein, Ind.

Lake Creek & Coeur d'Alene Railroad.—Incorporated in Oregon to build a road from Rockwood, near Spokane, Wash., to the southern part of Lake Coeur d'Alene, Idaho. Capital stock, $100,000. Incorporators: J. P. O'Brien, William Crooks, and W. R. Litzenberger, Portland, Ore.

Lima Kenton & Marion Traction Company.—Incorporated in Ohio to build a road connecting the towns named. Capital stock $100,000. Incorporators: W. H. Embert, Frank D. Bain, John B. Plitcher, A. G. Ahlefeld and A. Rosenthal.

New York Chicago & Boston Electric Railway.—Incorporated in Maine to build an electric and steam railway. Capital stock, $10,000,000. President, H. L. Cram; treasurer, A. F. Dunham; clerk, Fred Hale; Portland, Me.

Rapid Transit Railway (Wheeling, W. Va.)—Incorporated in West Virginia to build a railroad from Wheeling to Seabright Hollow, Marshall county. Capital stock, $1,000,000. Incorporators: Albert M. Schenck, A. S. Liot, J. V. Braden and George P. Tolman, Wheeling, W. Va.; Charles H. Ogden, Pittsburg, Pa.

ROLLING STOCK

Atlantic Shore Line, Portsmouth, N. H., recently purchased four 30,000 pounds capacity freight cars and three locomotives and will soon be in the market for 10 or 15 cars, both open and closed.

Boston & Northern Street Railway has ordered 40 semi-convertible cars, 46 feet long, from J. G. Brill Company for delivery in September.

Buffalo Lockport & Rochester Electric Railway, Albion, N. Y., has authorized J. G. White & Co., New York, to contract for 17 cars as the initial equipment of the line which is now under construction and is expected will be placed in operation about July, 1907.

Central California Traction Company, Stockton, Cal., is in the market for about ten freight cars and one electric locomotive.

Chicago & Joliet Electric Railway has added to its rolling stock five 28-foot double-truck vestibule cars, equipped with General Electric No. 80 quadruple motors, Brill No. 27 trucks and General Electric air equipment.

Cleveland Painesville & Eastern Railroad has ordered six interurban cars with Baldwin trucks and Westinghouse No. 112 motors from the Jewett Car Company.

Forest City Street Railway, Cleveland, Ohio, has ordered 24 cars from J. G. Brill Company.

Fort Wayne & Wabash Valley Traction Company has ordered five 55-foot combination baggage, smoking and passenger interurban cars, and two 50-foot express cars from the Cincinnati Car Company.

Galesburg & Kewanee Electric Railway has ordered from the Niles Car & Manufacturing Company two 51-foot interurban cars, which are to be equipped with Baldwin No. 167 trucks.

Goffs Falls Litchfield & Hudson Street Railway, through the National Railway Construction Company, 53 State street, Boston, has ordered six 40-foot closed cars from the Laconia Car Company.

Hamilton & Brantford Street Railway, Brantford, Ont., is reported in the market for some large, heavy cars.

Indiana Union Traction Company is having a sprinkling car built by the McGuire-Cummings Manufacturing Company.

La Electra Company, Guadalajara, Mex., has ordered 32 single-truck motor cars, 2 funeral cars, 2 double-deck double truck cars and 6 single truck trailers from McGuire-Cummings Manufacturing Company.

Lewiston Brunswick & Bath Street Railway, Lewiston, Me., has ordered from J. G. Brill Company 10 double-truck semi-convertible cars and three single-truck cars for delivery in December.

Mahoning & Shenango Railway & Light Company, Youngstown, O., has ordered 24 new cars 39 feet over all from the Niles Car & Manufacturing Company for delivery this fall.

Mobile Light & Railroad Company has ordered six Brill type semi-convertible cars mounted on 21 E trucks and six semi-convertible cars mounted on Brill G 27-1 trucks from the American Car Company, St. Louis.

Morris County Traction Company, Morristown, N. J., will be in the market this fall for several single motor equipments.

Northern Electric Company, Chico, Cal., has ordered four 58-foot interurban cars from the Niles Car & Manufacturing Company for delivery the middle of September and will build six at its own shops.

Oklahoma City Railway is having six 40-foot cars built by the St. Louis Car Company.

Omaha Lincoln & Beatrice Railway, Lincoln, Neb., will probably be in the market at an early date for additional equipment.

Oswego Traction Company, Oswego, N. Y., is having two single-truck, full-vestibule cars built by J. G. Brill Company.

Philadelphia & West Chester Traction Company has ordered seven interurban cars from Jewett Car Company.

Philadelphia & Western Railroad has ordered 18 cars from the St. Louis Car Company.

Philadelphia Rapid Transit Company has ordered 100 double-truck cars from J. G. Brill Company, as previously reported, for delivery beginning in September. The Pressed Steel Car Company is building 40 steel cars for elevated and subway use, five of which have already been delivered.

Portland Railway, Portland, Ore., has built at its shops, this year, four 45-foot suburban motor cars, two 50-foot trailers and several freight cars. It is now building in its own shops twelve 39-foot motor cars for city service.

Rockville Broad Brook & East Windsor Street Railway has ordered two 40-foot closed cars from the Wason Manufacturing Company, the order being placed through the National Railway Construction Company, 53 State street, Boston.

Washington Water Power Company, Spokane, Wash., has ordered 17 double-truck semi-convertible cars from J. G. Brill Company.

Winona Interurban Railway, Winona Lake, Ind., will probably order from 14 to 16 cars.

Youngstown & Southern Railroad has ordered five interurban cars from the Niles Car & Manufacturing Company.

TRADE NOTES

General Railway Signal Company has been awarded contracts for the complete automatic block signal equipment of the Philadelphia & Western Railway and the Nankai Railway of Japan.

J. G. White & Co., of New York, announce that Mr. E. N. Chilson has been appointed purchasing agent of the company. Mr. E. V. Peters will continue to act as assistant purchasing agent.

Railway Specialty & Supply Co., Great Northern Building, Chicago, has been appointed selling agent for the Smith improved lock nut, made by the Smith Improved Lock Nut Co., of Rockford, Ill.

E. T. Hannam, assistant manager of sales of the water tube boiler department of the Atlas Engine Works, and the inventor of the Atlas water tube boiler, died suddenly of heart disease, at Chicago, on August 18.

J. M. Broucher, of the Brownell Company, Dayton, O., has resigned his connection with that company to accept the position of assistant general managership of sales for the Atlas Engine Works of Indianapolis.

Weir Frog Company, Cincinnati, O., announces that Charles Partington has resigned as vice-president and manager of the company and that W. W. Allen, formerly connected with the Ramapo Iron Works, Hilburn, N. Y., has been appointed general manager to succeed him.

Gould Storage Battery Company, on September 1, removed its San Francisco office from the temporary quarters at 1701 Geary street to a permanent location in the Monadnock building. Previous to the earthquake the company had offices in the Crossley building, which was destroyed by fire.

Howard E. Troutman, for over ten years connected with the Buckeye Engine Company and for several years manager of its Chicago office, has resigned to accept the sales management of the Corliss and high-speed engine department of the Atlas Engine Works, Indianapolis. Mr. Troutman's headquarters will be at the home office.

Robert Job, who has recently resigned his position as chemist of the Philadelphia & Reading Railroad, has associated himself with Booth, Garrett & Blair, analytical and engineering chemists, 404-406 Locust street, Philadelphia. The company has thoroughly equipped laboratories and is prepared to make analyses of iron and steel, cements and all allied products and to furnish report.

Strauss Bascule & Concrete Bridge Company and the Wallace-Coates Engineering Company, both of Chicago, have entered into an agreement whereby the latter will act as general sales agents and constructors for the Strauss bascule and concrete bridges and the Strauss company will confine itself exclusively to the engineering work in connection with its special designs, and also will give its attention to general engineering.

H. M. Byllesby & Co., Chicago, have been retained as consulting, designing and supervising engineers for the modern gas plant being built by the Indiana Steel Company (a subsidiary company of the United States Steel Corporation) at Gary, Ind. George F. Maddock, formerly general superintendent of A. L. Ide & Sons, Springfield, Ill., and for some time past practising consulting engineer with offices in Marquette Building, Chicago, has joined the engineering staff of the company at Chicago.

Ohio Manufacturing Company, Upper Sandusky, O., is about to place on the market a gasoline motor for operating railway hand cars and contractors' dump cars, which, it is said, can be used successfully for running passenger and freight cars on short lines. It is stated that the new motor is of great power and that in recent tests it has been demonstrated that four or five loaded freight cars can be pulled on curved track, while the speed limits are expected to be at any point between one and 50 miles per hour.

F. W. Bird & Son, East Walpole, Mass., manufacturers of Paroid and Neponset roofings, have put in their dealers' stores doormats made of the Paroid roofing, this being evidently one of the best ways to prove the toughness and durability of the material. Samples of Neponset are put out in the form of a cone-shaped cup and the directions on the outside read: "Fill this cup with water and you will see that the water evaporates, but never soaks through Neponset." Those who are interested in roofing should send to F. W. Bird & Son, East Walpole, Mass., and ask for samples to make their own tests.

Electric Cable Company, 17 Battery Place, New York, report the receipt of further orders from the New York Central & Hudson River Railroad and Queens County Railroad Company for Voltax, a high potential insulating compound with which these railroads have been experimenting for several years. The New York Central will use this material in connection with the electrical work at High Bridge in the installation of the new electric railway work at that point. Among other railway companies using this material are the Illinois Central and Norfolk Railway & Light Company of Norfolk, Va. The latter company will use the Voltax compound for underground insulation work. The manufacturers state that Voltax liquid compound is being extensively used as a water proof paint, both for stone work in order to prevent moisture from sweating through and similarly for steam and cold water pipes as a preventive of moisture. The compound has been found to withstand an exceedingly high temperature when used as a paint for furnace doors and stacks.

ADVERTISING LITERATURE

Sawyer-Man Electric Company, New York.—An incandescent lamp dictionary is a useful publication of this company.

Rostand Manufacturing Company, New Haven, Conn.—This company has issued a circular describing and illustrating the McCarthy continuous hat and baggage rack for passenger cars.

Climax Stock Guard Company, 602 Title & Trust Building, Chicago.—Circulars describing gates for railway and farm purposes. The company states that a large number of railroads have adopted their farm crossing gates.

Berger Manufacturing Company, Canton, O.—A new catalogue of 32 pages and cover 9 by 12 inches entitled "Berger's Prong Lock (Wireless) Steel Studs and Furring for Fireproof Partitions and Ceilings." It is printed on heavy enameled paper and filled with exceptionally fine half-tone illustrations showing in detail the Berger system of fireproof construction together with views of prominent buildings in which this is used.

American Locomotive Company.—A pamphlet just issued by the American Locomotive Company presents a paper read before the New York Railroad Club by Mr. J. E. Muhlfeld, general superintendent of motive power of the Baltimore & Ohio Railroad, reproduced with extracts from the discussion by permission of the club.

Greenway Company, Detroit, Mich.—This company has issued an interesting pamphlet entitled "The Remedy for Steam Trap Troubles." It is devoted more particularly to a description of the Greenway steam trap The company manufactures also separators, exhaust heads and other steam specialties.

Westinghouse Electric & Manufacturing Company, Pittsburg, Pa.—Circular No. 1129 describes Westinghouse No. 119 railway motor for direct-current service. Circular No. 1134 describes electric and mechanical brakes for Westinghouse type K motors.

Schwarze Electric Company, Adrian, Mich.—A booklet describing electric bells and railroad signaling apparatus. The Schwarze universal bell is in use on the Michigan Central, Lake Shore, Wabash and a large number of other leading railroads.

Philadelphia Air Brake Company, Real Estate Trust Building, Philadelphia, Pa.—A new catalogue, 9½x6½ inches, describing air brakes for street and electric cars. It has seven full-page halftone illustrations describing the apparatus.

De La Vergne Machine Company, New York.—A 48-page catalogue 6 by 9 inches, describing refrigerating and ice making machinery. It is filled with exceptionally fine illustrations.

Allis-Chalmers Company, Milwaukee, Wis.—Bulletin No. 1505 illustrates and describes the Allis-Chalmers heavy duty engines.—belted type. It has 26 pages. Bulletin No. 1051 describes Allis-Chalmers alternating-current generators, belted type. Bulletin No. 1052 illustrates and describes type B motors and generators.

Joseph Dixon Crucible Company, Jersey City, N. J.—This company has recently issued a pamphlet illustrating and describing its graphite brushes for generators and motors. A summary of the conclusions deduced from tests made upon the brushes of Prof. Albert F. Ganz of Stevens Institute, is also included.

Whiting Foundry Equipment Company, Harvey, Ill.—Catalogue No. 45 contains 162 pages illustrating and describing electric travelers and cranes of all types. It has over 100 illustrations showing the installation of cranes in railway shops, power houses and other places, and also showing special derricks for railroad and marine service. Several pages of the catalogue are devoted to a list of prominent users of Whiting cranes. There is also an index covering four pages.

Trolley Supply Company, Canton, O.—A catalogue and price list of Climax headlights for street railways. These are of various styles and types and fitted with multiplex or parabolic reflectors. One page is devoted to testimonials from seven railway and traction companies that are using these headlights.

New Era Manufacturing Company, Kalamazoo, Mich.—Circulars describing Nickelumen, a white bronze bearing metal especially adapted for heavy bearings and street railway service. The company states that all its babbitts are tempered with metallic phosphoro, which increases their service 25 per cent.

Solid Steel Tool & Forge Company, Brackenridge, Pa.—This company is distributing an Index of the specialties it manufactures. This includes all classes of car forgings, railway track tools, nut locks and general forgings.

S. F. Bowser & Co., Fort Wayne, Ind.—The fourteenth edition of catalogue No. 1 is now being distributed. It illustrates and describes the new Bowser self-measuring oil tank; has 64 pages, 4½ x 6 inches, and is filled with excellent halftone illustrations. Catalogue No. 3 is of the same size, and has 48 pages. This describes the Bowser self-measuring factory, railroad and marine oil cabinets. Many of the cuts are shown in colors.

American Valve & Meter Company, Cincinnati, O.—Catalogue of 60 pages, 6 x 9 inches, describing the Poage automatic water columns with rigid and flexible spouts, tank valves, tank pipe valves, automatic float valves, relief valves, tank indicators, etc. A table of contents covering one page makes easily accessible the large amount of detailed information in the book. The company issues special catalogues for switch stands and track appliances, water meters and valves.

NATIONAL AIR COMPRESSORS.

The accompanying engravings illustrate the improved motor-compressor which has been designed by the National Brake & Electric Company, of Milwaukee, to conform to the present demand for the most efficient brake apparatus, and to effect those changes in the standard equipments manufactured by this company's predecessors (the National Electric Company and the Christensen Engineering Company) which experience had indicated as desirable, but which had not been made because of existing conditions and a desire to keep the apparatus standard. This line will be known as type A-4 National compressors, and will comprise six sizes with capacity for 11, 16, 20, 27, 35 and 50 cubic feet, respectively, of free air per minute.

Figure 1 shows an exterior view with the door giving access to the commutator open. The motor and compressor are both separate, self-contained and distinct units, making the complete compressor most compact and rigid. The only exception is that the motor bearing at the pinion end forms a cover for the top of the gear. There is a ½-inch air space between the crank chamber cover and the motor base, which prevents the heat being communicated from the compressor to the motor. This separate cover for the crank chamber provides the necessary bracing and stiffening for the crank chamber casting.

The simplicity of design and construction and the accessibility of all parts such as are at all likely to need attention are well shown in the illustrations.

Figure 2 shows the crank chamber with the cover removed. The crank shaft is provided with a third bearing in the center, which steadies the crank shaft and supports it at its weakest place and does away with all tendency for the shaft to fracture in the center. The compressor runs much more quietly and free from vibration with this third bearing, and the efficiency and life of the pump and gearing are materially increased. The crank shaft and gear are removed by lifting them straight out of the crank chamber, it being unnecessary to first remove the gear from the shaft. This increases the accessibility of the pump and considerably reduces the time for taking it apart and putting it together again. The gear and crank move in a bath of oil and splash it over all the moving parts of the compressor. The gear case is cast as an integral part of the crank chamber instead of being a separate casting, thereby making a very rigid pump base and reducing the number of loose parts, and also making it unnecessary to drain the oil from the gear case and crank chamber when inspecting it. The compressor is a standard two-cylinder, single-action type with trunk pistons. The piston rings are the Dunbar type which were adopted as standard eight years ago. The sections of the ring are carefully fitted by hand and the complete ring is then ground true. The pistons are each provided with one piston ring. The piston wrist pin on which the tail end of the connecting rod works is of steel hardened and ground true, and pressed into place and secured so that it is impossible for it to work loose. The connecting rod head, instead of being loose is connected to the body of the rod by means of a hinge and hinged eye-bolt. This has the advantage that there is only one bolt to adjust or slacken, as the case may be; and this one bolt is provided with lock-nuts and a split pin, to prevent loosening under the continual reciprocating strains.

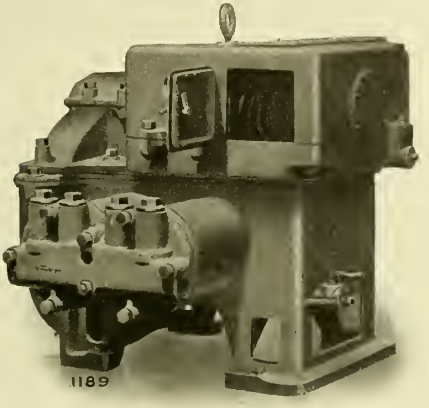


Figure 1.—Type 4-A, National Compressor.

As shown in the three-quarter view of the valve head the discharge valves are placed towards the center and the suction valves toward the outside of the head. The discharge pipe goes straight out from the valve head to the main reservoir, there being no necessity for attaching elbows, etc. The suction has two openings, one at each side of the valve head. Either or both can be used. They are provided with straining screens, and the air can either be taken straight into the cylinder or piped from the inside of the car, or from the car roof. The valves are such as have been used in standard practice for small air-compressor work for the past ten years and have given very good satisfaction. The suction and discharge valves are interchangeable and are of the solid cold-drawn tubular-steel type; they are seated by gravity aided by air pressure, neither springs nor auxiliary devices being required. The gear and pinion are a standard herring-bone pattern with fine teeth. The gear is of open-hearth cast steel and the pinion of high-carbon steel. They are made in two halves and riveted together. Both the gear and pinion have their teeth carefully cut on accurate gear cutting machines, which have been especially designed for use for these purposes. Both gear and pinion are carried on their respective shafts by a taper fit and clamped with lock-nuts, in order to facilitate their removal at any time. The lower half of the motor magnet frame is a steel casting which also carries the bearings and forms a cover for the upper half of the gear. This construction is considered a great improvement over the type with loose bearing brackets or bonnets, as it insures that all parts are kept permanently in line and the armature will be correctly replaced if at any time it is removed. The diameters of the shaft and bearing at the pinion end have been considerably increased over the company's former practice, in order to stiffen the shaft at its weakest point. An oil thrower has been attached just inside of the pinion end, so as to prevent the oil from the gear and pinion working into the armature bearing and flooding the motor. The armature bearing at the pinion end is also provided with an overflow into the crank chamber, to keep the oil level constant, even, though some oil may creep over past the thrower.

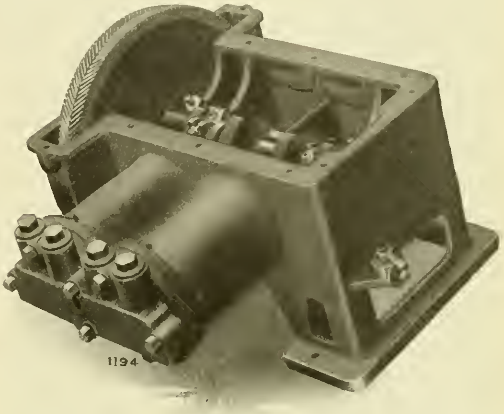


Figure 2.—National Compressor, Crank Chamber with Cover Removed.

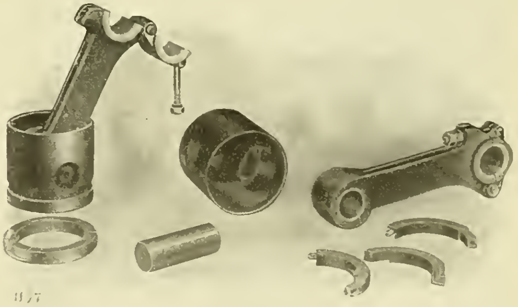


Figure 3.—Piston and Rod, National Compressor.

The motor is of the company's standard four-pole consequent-pole type with series wound armature. Two field coils are arranged in a horizontal plane to reduce the over-all height of the motor compressor. The field coils can be quickly removed, the one by merely taking off the top half of the motor and the other by taking off the top half of the motor and removing the armature. Special attention is called to the brush gear, notably in regard to insulation. Compressor motors operating under a street car are liable to get covered with oil and dust, and unless the insulators have an ample margin, they will not last. The current either gradually works over the dirty surface or through on the inside of the oil saturated bushing. In the new type of brush holder the insulation has been liberally designed, the external leakage surface being about 1¼ inches. There is also an insulating shield between the bearing and commutator to prevent any chance of a flash over at that point such as occasionally occurs because of extraordinary variations of the voltage on the trolley wire. The brushholders have been provided with the company's improved patented spring tension which is constant over a wide range, and is capable of being easily and accurately adjusted. The motor is completely enclosed to protect it from the weather and do away with the necessity of enclosing the motor in a suspension box. An oil thrower is provided between the pinion bearing and motor casing to prevent oil finding its way to the motor armature or commutator. Inspection doors are provided on the side of the motor casing, and a hand hole on the top of the motor casing for examination of the commutator and brushes.

The cap screws and bolts have been designed so that only one size of bolt head is used on any size of compressor, and a standard socket wrench is furnished for use on the compressor to facilitate all repair work.

The oil-filling and oil drain holes are so arranged as to be convenient and sightly. The vent holes for the crank chamber are cast in the side of this chamber, being suitably protected to prevent oil splashing out, and are of sufficient area to entirely do away with the usual tendency to force the oil vapor and oil from the crank chamber into the motor bearing and armature. This arrangement dispenses with all elbows and goose necks.

The motor compressor is supported in a cradle under the car, a position which leaves the pump exposed to the cooling action of the air and at the same time admits of ready accessibility of all parts.

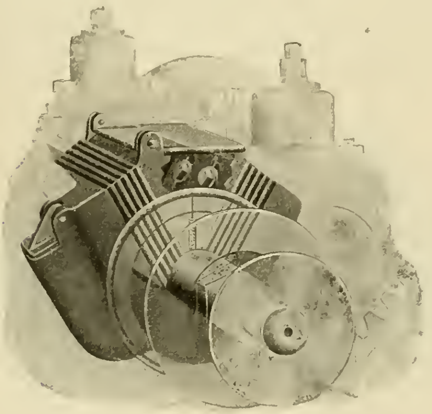
The 11-foot compressor will also be made in the open type for placing under a car seat, this type being identical in every respect with the standard enclosed type, except that the motor casing is omitted.

The company manufactures its motor compressor for the standard direct-current voltages of 500, 550 and 600, and for single phase 25-cycle circuits of 200, 250 and 300 volts, these alternating current compressors being suitable for running on either alternating or direct current. In the design great care has been taken to arrange the details to facilitate operation and inspection.

NEW PLANER CONSTRUCTION.

The J. A. Fay & Egan Company has recently placed on the market a new device consisting of a patent sectional clamp bearing for cylinder journals, which the company is now placing on its No. 156 single-cylinder planer.

The X-ray view shown will give an idea of this invention. Each of the cap bearings is made up in two sets of thin babbitt metal plates, five to each set. The edges of these plates in contact with the journals are turned on a lathe to describe the circumference of the lower bearing. They rest diagonally upon the upper surface of the journals and exert no pressure downward except that produced by their own weight. By simply loosening the clamp bolts and pressing the plates down by hand, all looseness of the journals from wear may be taken up each day. No packing or liners are used. The manufacturers state that no matter from what direction the machine is belted there is no heating of the boxes and there is never any occasion to scrape and rebabbitt the bearings, for the babbitted plates take up their own wear.

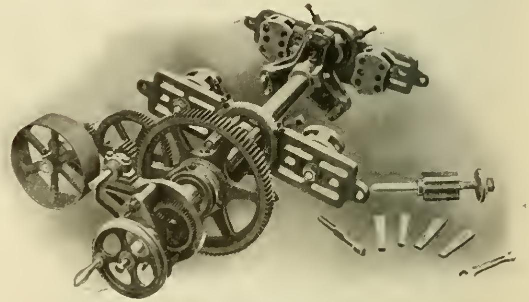


New Sectional Clamp Bearing.

Circulars giving all details of every part of this tool and showing two views of the machine may be had on application to the manufacturer.

UNDERWOOD PORTABLE BORING BAR.

The accompanying engraving illustrates the portable boring bar manufactured by H. B. Underwood & Co., of Philadelphia, which is designed for general cylinder boring. The bar can be operated in a space no larger than that needed to remove the piston from the cylinder, and by its use the reboring can often be done in place in less time than the cylinder could be dismantled and removed to stationary machines, with the advantage that all steam connections and the principal joints remain unbroken. The sizes in which the bar is made vary from a 2½-inch bar 5 feet long for cylinders 4 inches to 12 inches in diameter by 30 inches stroke, to a 12-inch bar 15 feet long for cylinders 60 to 120 inches in diameter by 120 inches stroke. With each bar enough cutter heads are furnished to cover the range of diameters for which the bar is designed, and expanders to fit stuffing boxes are provided. The feed screw and nut are of steel. The bars may be either hand or power-operated.



Portable Boring Bar.

In a recent publication of the manufacturer the following directions for setting up and operating the bars are given:

In reboring a cylinder the object is to make it perfectly true, and at the same time to remove as little metal as is possible. In doing this a great deal depends on the setting up of the bar and the shape of the cutters. In setting up a bar to bore with both cylinder heads off, bolt two blocks on each flange as near oppoite each other as it is possible to get them, using the cylinder head bolts. If there is a raised face inside of these bolts, clean it off. Back up the outer edges of the blocks with thin metal so the face will be in line when screwed up tight. Place a suitable size cutter-head inside of the cylinder, then put up the crossheads that support the sleeves or bearing; bolt the crossheads firmly to the blocks, using the studs with a nut on each end. After the bearings are in place push the bar through, and use the long set screws on the crosshead for fine central adjustment; then place a blank piece or tool in one of the cutterhead arms, and turn the cutterhead around, with the tool in the counterbore or unworn part of the cylinder, and adjust the bar until it is perfectly true with the counterbore or unworn part, preserving the original centers of the cylinder, providing they are parallel with the guides and square with the crank; if the counterbores are not true, run a line through and make four punch marks on each cylinder head and adjust the bar to these marks. When the bar is perfectly adjusted, place the tools in the cutterhead and adjust them and it is ready to start boring.

When a quick job is required (also in boring larger cylinders where only one head comes off), and it is seen from the appearance of the cylinder that it is in line, it is not necessary to take the head off next to the guide. Remove the gland and rod packing, clean the stuffing box thoroughly and place the expanding chuck and proper size gibs in, screw the nut and washer up loosely by hand so that the chuck will remain in the box, then after the blocks and crosshead are in position as directed, push the bar into the cylinder, and the hole in the end of the bar will fit the pin projecting from the chuck. (It is well to have a small portion of clean waste thoroughly saturated with oil placed in the hole in the end of the bar.) When the bar is resting on the pin, revolve by hand until set centrally, then tighten up the screw in the expanding chuck fairly tight until the bar revolves without binding too hard. It is then ready to proceed with the boring.

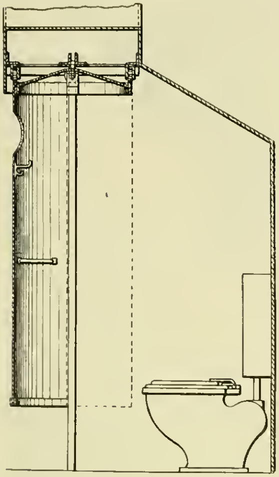
In boring the smaller sizes of cylinders with the bar in position, it is sometimes difficult to locate and bore the counterbore next to the gland end. To do this very satisfactorily, take a light piece of wood a little longer than the cylinder, and at one end of this insert a wire nail with a point and drive it through, the end projecting about one-half inch. With this point the worn part or the shoulder worn by the rings can be readily felt. Then mark on the stick the end of the cylinder, and lay off on the stick the stroke and width of rings, making proper allowance for travel of rings over counterbores, and place the bent counterboring tool in and run it up to the spot, having it slightly tightened. When in position, take the thin end of the long socket wrench (which is a wedge), and place it between the adjusting screw of the cutterhead and the end of the tool; then take a wrench and turn the bar slowly by hand keeping a pressure on the wedge. When deep enough stop the bar, tighten firmly with the socket wrench and proceed boring until up to the cylinder head; that can be noted by the stick and nail.

To remove the cutter after counterboring, turn the cutter up, loosen the binding screws and drop the cutter down, then run back with the feed screw, leaving a clean cylinder not scored by the cutter.

In sending out these bars there is sent a sample set of tools, which are about as practice suggests. The tools should be like heavy side tools cutting on the face, thereby throwing no bending strain on the bar, leaving it free to guide the cutting, driving and feeding. This is important, as ever so slight a corner off these cutters throws the strain at right angles to the cutting, and hence a great strain on the bar and may cause chattering when in the cylinder. By a proper care of the shape of the tools, a much smaller bar can be used than otherwise.

THE BROWN SANITARY CLOSET SHIELD.

The sanitary appliance for a water closet illustrated herewith is an entirely new construction. It is patented by Alex. E. Brown, and manufactured by the Brown Hoisting Machinery Company, Cleveland, Ohio.

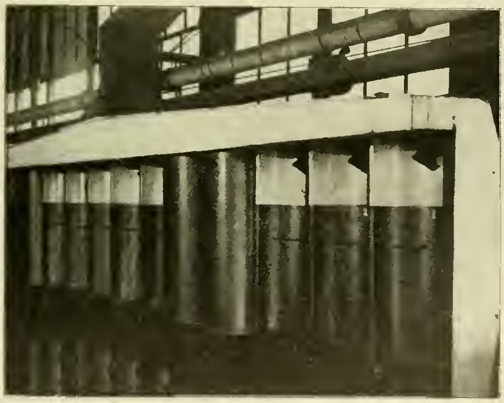


The Brown Sanitary Closet Shield.

It consists of a series of compartments, separated by concrete steel partitions of the Ferroinclave construction, attached to light angle supports, and covered by one concrete steel hood, also of the Ferroinclave construction, which runs to an apex at about an equidistance from either end partition. At this apex is a ventilating pipe. With the exception of the two ends, the partitions do not extend up to the hood, thus giving sufficient air circulation. As will be seen in the cross section the hood extends out over the doors.

The doors are hung from light angles, which extend across the partitions, and are made of steel plates rolled in the form of semi-cylindrical shells. They are hung from the top instead of from the side, and are so adjusted that in rotating on rollers they describe the path of a cylindrical shell about its vertical axis.

Some of the advantages claimed for this appliance are: A saving of space, practically three feet being saved by this door, over the ordinary side-hinged style; its sanitary features, the excellent hood or ventilating system taking away all odors, and the concrete walls allowing easy cleaning with a hose; the interior is at all times closed to the outside view thereby making it practicable to erect at points in a building that would be too much exposed for the types of closet in ordinary use. It can readily be seen by the door whether the closet is or is not occupied. A closet cannot be occupied without the door being out. This fact, together with the lack of light and the partitions, is the means of a great saving in time, in that it eliminates usual causes for loafing.



The Brown Sanitary Closet Shield.

SEMI-CONVERTIBLE CARS FOR SUBWAY AND INTERURBAN OPERATION.

Among recent shipments made by the J. G. Brill Company were 40 cars for the Old Colony Street Railway Company and six for the Boston & Worcester Railway. In ordering their new equipment, both of these companies specified the Brill grooveless-post semi-convertible feature, and although the cars vary in length, they are very similar in design. The cars will be operated through the Boston subway and it is for this reason that the posts are inclined a trifle to give the necessary clearance for the upper part of the car when in the tunnel and at the same time preserve the maximum interior width. The vestibules and entrances have a num-

Old Colony Street Railway—Head End of New Car.

Boston & Worcester Railway—Interior of New Brill Car.

ber of novel and interesting features and reference to the interior view of the Old Colony car shows that the doors in the body ends are omitted. This arrangement allows a wide opening, 50 inches, facilitating passage in and out without weakening the construction. The windows between the door posts and corner posts have bronze vertical bars.

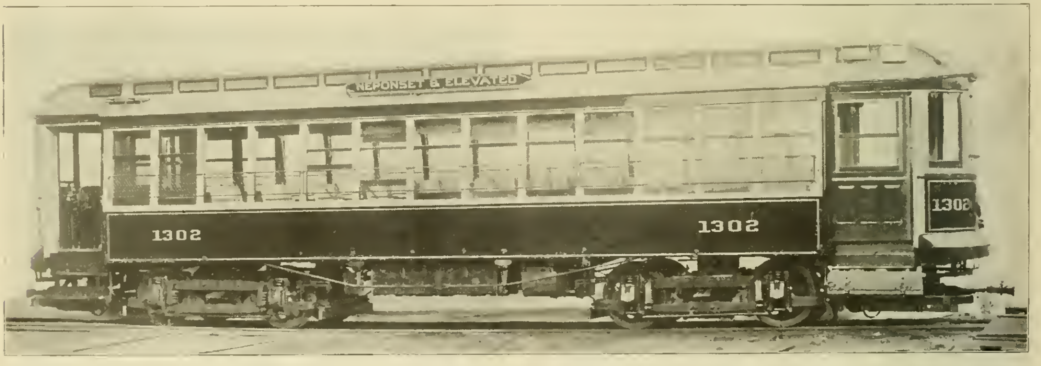
The Boston & Worcester cars have the usual sliding doors at the body ends. A feature common to both cars is the manner in which the lower step at the entrance is arranged to fold up and this is effected by the lower step and the sliding door at the entrance working in unison. The entrance doors slide into pockets provided for them in the car body and, the grab handles being inside the door, no foothold can be obtained on the upper step. The sliding doors and folding steps are operated by the motorman by means of a valve located under the air-brake valve, the power being furnished from an auxiliary tank connected with the air-brake tank. Access may be had to the pockets in the sliding doors at the entrance by swinging the window sashes back of the longitudinal seats. These sashes are hinged while the outer sashes are stationary. The doors have double sash windows with the upper sash arranged to be lowered, and a wire screen is provided to guard the opening.

A feature peculiar to the cars for the Old Colony Street Railway Company is the compartment for the motorman formed by the conjunction of two pairs of hinged doors which operate on roller bearings in a V-shaped runway. When not required to form this compartment, each pair of doors is snugly folded and secured to the vestibule corner posts of the platform. Suitable curtains for preventing the reflection of light from the inside of the car, are provided.

Attention is called to the lighting arrangement in both car interiors. A one-inch brass pipe containing the light wires extends the full length of the cars and into it are screwed nipples to which the lights are attached. One light is placed over each cross seat and two lights over each longitudinal seat. To another brass pipe extending over only that space occupied by the longitudinal seats is attached the hand straps. The grab handle against the body is novel in that it is curved over the top of the step to the body door post. In both instances the cars have a shield on the bumper to prevent persons from gaining a foothold thereon. It will be noticed that the radial drawbars are carried unusually low on account of the step arrangement. The interiors have all the features which have made the grooveless-post semi-convertible type of construction so popular, and are fitted with such accessories as arm rests, push buttons, etc. The seats are of the builders' make and numerous Brill specialties have been used throughout the cars.

All the cars are mounted on the Brill 27-E1½ type of truck having solid forged side frames; the ends of the frame extensions are bent around for extra clearance. The wheel base of these trucks is 6 feet 4 inches and the wheels are 34 inches in diameter. Each of the cars for the Old Colony Railway has four motors of 40 horsepower capacity, while the motors installed in the cars of the Boston & Worcester Railway are of 75 horsepower capacity. The general dimensions of the cars for the Old Colony Street Railway are: Length over end panels 33 feet 11 inches and over vestibules 44 feet 11 inches; the cars for the Boston & Worcester measure 40 feet 1¾ inches over the end panels and 52 feet 5½ inches over the vestibules. The framing of the cars is very substantial and in the case of the Boston & Worcester cars includes 4 x 8¾ inch side sills with 15 x ⅜ inch sill plates; the corner posts are 3¾ inch and the side posts 3¼ inches thick.

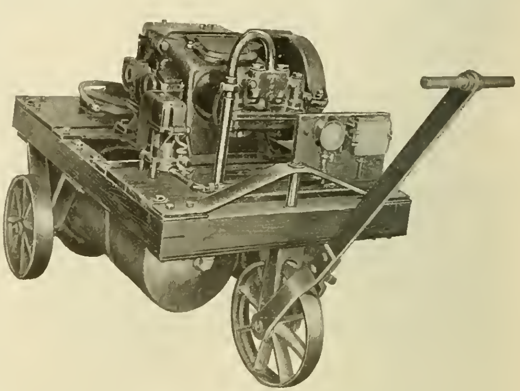
A number of improvements have been made of late by the Boston & Worcester Street Railway Company, among which may be mentioned the extending of the double track between Framingham Center and White's Corner, Southborough, a distance of four and a half miles; the completion of which work will see Boston and Worcester joined by a continuous double track. The company has secured permission from all the municipalities through which their lines run for the carrying of express and light freight and contemplate a freight and express department as soon as the double track is completed.



Old Colony Street Railway—New Car for Subway Operation.

PORTABLE AIR-COMPRESSOR OUTFIT.

A neat and compact portable air-compressor outfit has recently been placed on the market by the General Electric Company. A convenient means of obtaining a supply of compressed air for various purposes about power house and car barns is in demand and the new outfit admirably meets the requirements of such service. Being portable the entire set can be drawn to different parts of the power house or shop or put on cars and transported to substations. The electrical connection with the trolley circuit is quickly made through a contractor box on the truck and a convenient length of hose is used to convey the compressed air to the work. This eliminates waste of air due to unnecessarily long hose or leaky pipe connections.



General Electric Portable Air-Compressor Outfit.

The portable set consists of a standard CP 22 (24 feet) air-compressor similar to that used in the company's air brake systems, a governor, insulating connector, safety valve, gauge, combined switch and fuse, two reservoirs 16x48 inches, hose, contactor box, and stop-cock, all mounted compactly on a three-wheel truck, as shown in the illustration. In the center of the truck is placed the air-compressor and motor with the governor at one side and the gauge and circuit-breaker mounted on a small board in front. The two steel reservoirs are carried beneath the truck floor, keeping the center of gravity of the outfit very low. The framework and tongue are of wrought iron and the front wheel is hung in a pivoted fork of the same material.

The various parts of this outfit are of the same standard and durability as the regular General Electric Company air brake equipments for cars. With each machine 25 feet of special armored air-hose is furnished complete with stop-cock, coupling and nozzle for connection to machines or for cleaning purposes. The general dimensions of the portable air-compressor set are as follows: height 3 feet 7 inches, width 3 feet 11 inches and length 5 feet 8 inches. The whole outfit is compact and durable as a railway motor and has a wide application along the lines indicated.

THE BUCKEYE GAS ENGINE.

Recognizing the need for a reliable and economical engine particularly adapted for direct-coupled generator driving, and fed by suction producer gas, the Buckeye Engine Company of Salem, Ohio, has developed a new type of internal combustion engine which is said to work equally well with other fuels such as natural, illuminating and blast furnace gas, or gasoline.

This engine is built in sizes from 25 to 500 brake-horsepower. For units above 500 horsepower double-acting engines are built of both the two and four-cycle types.

This new engine is of the two-cycle type, scavenging and single acting. There are two motor cylinders, fuel and air pumps and cranks, 180 degrees apart. This gives two working impulses to each revolution of the crank shaft. The cranks being exactly opposite, and to which are attached the two sets of pistons of equal weight, the engine needs no counterweighting and turns at nearly perfect running balance.

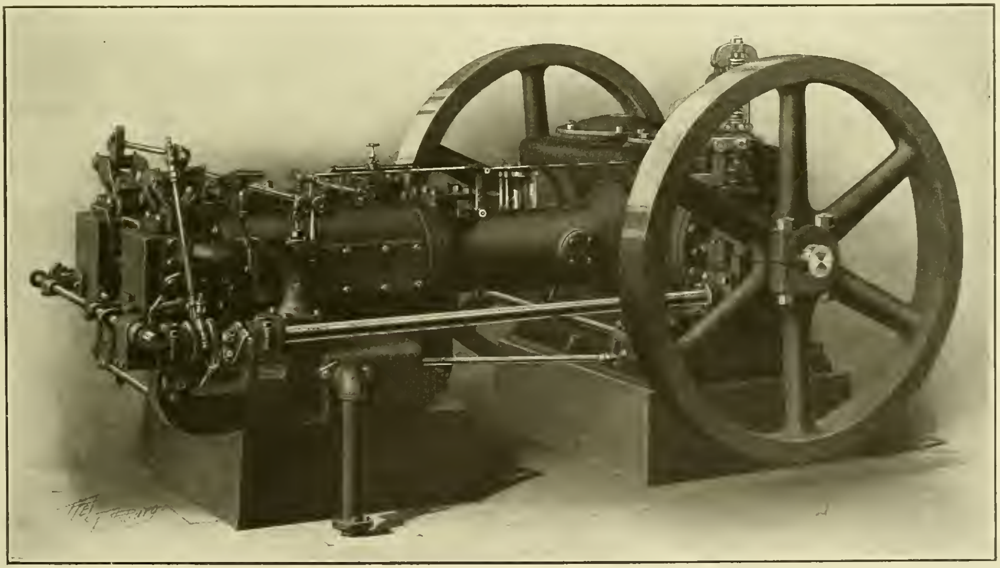
Operation.

The piston in the left-hand crosshead barrel furnishes air at a pressure of about eight pounds per square inch for the right-hand scavenging combustion chamber, and the piston in the right-hand crosshead barrel compresses air at the same pressure for the scavenging combustion chamber in the left-hand cylinder. Referring to the longitudinal section through the right-hand engine, and piston just uncovering ports 14, the compressed air furnished by the air pump in the barrel enters the combustion chamber, 1, through valve 11 and port 19, forcing out the spent gases. A section through the combustion chamber at A A is circular and the conical form assists in spreading the scavenging charge evenly behind the spent charge. Somewhat later, valve 10 opens, admitting into the cylinder a charge of explosive mixture which has been compressed in chamber 3 in front of the gas piston. It is thus seen that each motor piston compresses its own explosive mixture but receives its compressed air for scavenging from the opposite engine. Since valves 10 and 11 are independently driven the relative timing of the admission of the scavenging air and the mixture is under perfect control.

When the gas piston has covered ports 14 on the return stroke the compression begins in the motor cylinder, providing valve 10 has closed. The compression being complete, the charge is fired in the usual way, firing occurring alternately in the two motor cylinders.

Pump Valves.

One of the illustrations is a section through the piston valve body, 30, of the right-hand engine wherein are the two balanced piston valves, 62, for admitting a mixture to the gas pump in the right-hand cylinder and 63 for admitting a charge of air into port 69 which is in connection with air pump in the left-hand barrel.



Buckeye Gas Engine—Side View.

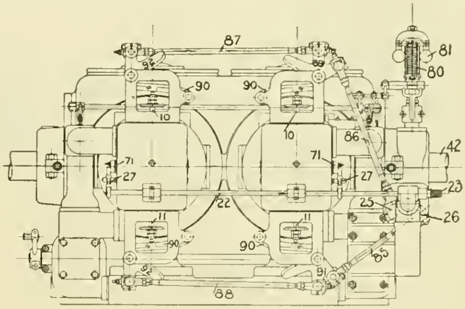
The chamber 68 communicates with the atmosphere through the sub-base of the engine. Valves 62 and 63 serve only as admission valves to their respective pumps.

Speed Control.

A valuable characteristic of this engine is the one so much sought for by all gas engine designers, namely, constant compression and constant mixture at all loads combined with quick and certain response to sudden change of load. The quantity of air passing through the air pumps is constant at all loads, but the amount of air and gas handled by the fuel pumps varies according to the load carried.

Gas Regulation.

When the piston valve 62 uncovers ports 64, the fuel is sucked into chamber 61 and from there through the balanced throttle valve 60 into chamber 61 which connects with chamber 18, Fig. 1, the latter being, as previously stated, part of the compression chamber of the fuel pump 3. The amount of fuel passing through valve 60 depends on its position, this being directly controlled by the governor.



Buckeye Gas Engine—End Elevation.

When the compressed fuel flows from pump cylinder 3 to 83 and the combustion chamber, it must return through valve 60 or retrace through the same way it entered. Thus clearly valve 60 controls the amount of fuel entering the gas pump as well as the amount flowing from the gas pump to the combustion chamber. This combination of the fuel piston valve 62 and the throttling valve 60 results in high economy of pump work and quickness of action.

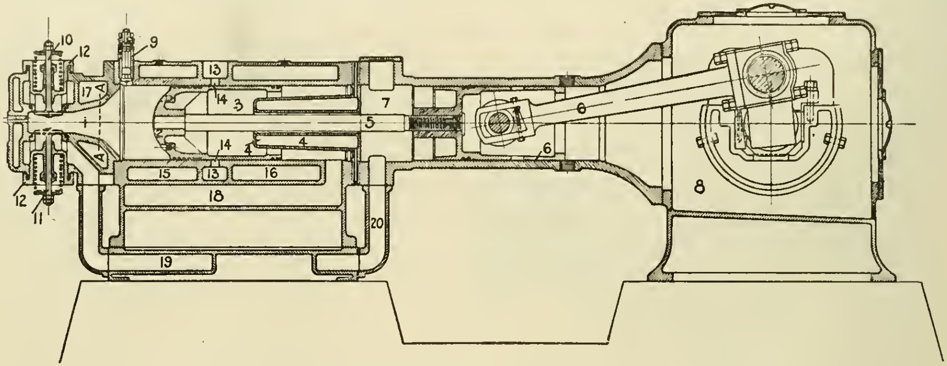
There are two sets of ignitors in each combustion chamber. The engines are also provided with jump spark ignition apparatus. The change from one system to the other can be made in a few minutes' time. The cylinder sides and heads are water jacketed.

Main Bearings.

Main bearings contain babbitted shells of ample area and have complete means for alignment and taking up wear. In this type of engine, owing to the action on each connecting rod of the combined air and fuel pumps and motor piston, it makes no material difference whether the wrist and crank pin bearings are carefully adjusted since the pressure is always in the same direction and therefore the engine will run quietly should all the boxes be loose.

General Characteristics.

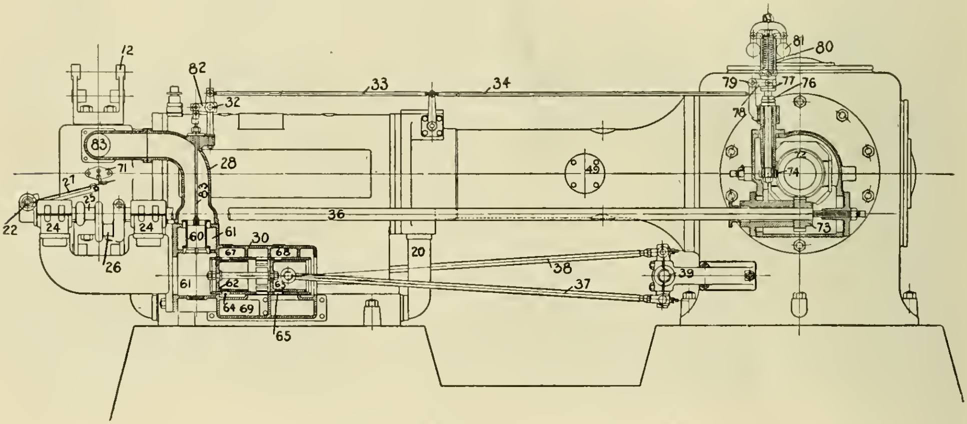
It is claimed that in one end of the combustion chamber the mixture is unquestionably constant at all loads. The ignition is always certain from full load to no load. On account of the combined cooling action of the water jackets and the scavenging air, a higher degree of compression can be carried than in four-cycle engines unless the latter are kept uneconomically cool.



Buckeye Gas Engine—Longitudinal Section through Right-Hand Engine.

An important feature in this engine is that expansion can be carried to any point whatever. In the ordinary four-cycle engine the amount of expansion is dependent on the original volume admitted. In this engine the fuel valve can be so set that the compression may begin, say, at half stroke; in this case expansion would be to twice the volume admitted. In the smaller sizes this feature will not be made use of, but in the larger sizes an increased thermal economy is thus available.

Suction producers require a variable amount of draft in their operation due to varying conditions of the fuel bed. Here a great advantage is obtained since the fuel pump in this engine has ample capacity to supply the engine with fuel no matter what the draft may be within large limits and a producer can in emergencies be forced beyond its rated capacity without seriously diminishing the power of the engine.



Buckeye Gas Engine—Section through Piston Valve Body.

This engine is also self-cleaning, thereby making it unnecessary to take off heads and valves for cleaning. All dirt is blown out and after many months of continuous service on suction producer gas the combustion chamber has been found absolutely clean. This feature is valuable when using jump-spark ignition, since there will be no trouble due to fouling of ignition plugs and the consequent destroyed insulation. If so desired, a super-compression can be obtained whereby the main compression begins say at three to five pounds above atmospheric pressure. This increases the capacity of the engine with a possible slight decrease in thermal efficiency.

An engine of about 75 horsepower with cylinders 9 inches in diameter by 12-inch stroke has been found by repeated tests to develop a mechanical efficiency of over 85 per cent, the pump work being included as friction.

The explanation for this high mechanical efficiency lies in the co-ordination of pump and motor cylinders, no loss by wire drawing through valves, due to ample valve areas, the positive operation of all valves, balancing of all valves, and absence of stuffing boxes.

Purdue Electric Railway Laboratory.

The new electric railway laboraory of Purdue University, Lafayette, Ind., has been completed, and the extensive equipment to be used in testing large electric cars and motors is now in readiness for the opening of the fall term on September 12. The laboratory is in a large brick addition to the electrical engineering building and is built to conform to the main building. Inside there is a large lecture room, overhead cranes strong enough to pick up an entire car and convey it to any portion of the building, and a large pit in the basement, enabling the students to work beneath the car as it stands on the rails. The tracks leading ino the building are connected with the steam railroad, affording direct connection into the laboratory. Purdue Univedsity is the first school to take up the study of electric cars in such an exhaustive manner. The lecture room will seat more than 300 students, and the tracks and overhead cranes are so arranged that entire cars or sections of the motors and other apparatus can be carried directly into the lecture room from the laboratory and be exhibited to the students. The motors and other apparatus can also be brought into the lecture room and placed on large demonstration tables, where electrical connections enable the professor in charge to operate the piece of machinery as he demonstrates it before the students.

Electric Railway Review

PUBLISHED MONTHLY BY THE WILSON COMPANY, CHICAGO
New York: 150 Nassau Street Chicago: 1660 Monadnock Block Pittsburg: 510 Frick Building
Subscription Price, $1; Foreign, $3; Single Numbers, 10 cents
Entered at the Post-Office, Chicago, Ill., as Second-class Matter

Vol. XVI OCTOBER, 1906 No. 10

Man-Power Coal Handling.

With the great majority of small power plants no little difficulty is encountered in attempting to handle the coal economically between the railroad and the fire room. Operators differ widely as to the size of plant which financially justifies mechanically-operated conveyors and stokers, but it is seldom that one finds such equipment in stations whose rated capacity is below 3,000 kilowatts. There is nothing new in the suggestion of needed improvement in methods of handling coal, but the persistence with which many plants fail to take advantage of their conditions in this respect justifies further reference to the subject. There is a mistaken idea held in many quarters that muscular labor is a pretty cheap sort of operating machinery. Only a few days ago the question came up in a plant which has to pay 20 cents per ton to get its coal from the steam railroad car into the bin outside the boiler room, whence it has to be wheeled, barrow after barrow, and dumped before the furnace doors. Three men are employed to shovel the coal from the car into a two-horse dump cart, and a fourth to drive the latter 75 feet to the coal pile, empty it, and return. The fireman then draws from this pile.

Gravity-Power Coal Handling.

In the plant under consideration there would probably be too great expense attached to the installation of elaborate coal-handling machinery. At the same time, it is difficult to see why the railroad siding could not be elevated and the bin location changed to permit the dumping of the fuel—or if need be, its shoveling—directly from the car into the bin itself. With high class machinery coal can often be laid down in the fire room at from three to five cents per ton. Certainly it ought to be possible to cut the cost to 10 cents in the case cited. The capitalization of the operating cost of horses and two men at least would probably exceed the cost of the trestle by a large amount, and it is always well to remember in handling fuel that the force of gravity is about as inexpensive an agent as can be found in the engineering world. In small plants the boilers are of necessity hand fired, but the laying down of the coal in the bin from the car or barge ought to be accomplished with an irreducible minimum of manual labor. A simple pneumatic hoist fitted to rollers for jib crane travel, a home-made crane and a grab bucket will accomplish wonders in the way of cheap coal handling.

Electric Freight Classification.

One of the points on which the managers of electric interurban railways deserve most to be censured is the failure to inquire into the experience of the older transportation lines before putting into effect policies which, when once adopted, are extremely difficult to change. It will be recalled that a number of interurban lines, when beginning operation, established very low rates of fare, either because this was deemed necessary to secure business from competitors, or because of misapprehensions as to the cost of service rendered, and afterwards found it necessary to increase their rates. Increasing the rates of fare generally aroused considerable and serious public antagonism. A similar mistake is now being made with regard to freight tariffs, some electric lines handling freight at the same rate per hundred pounds, regardless of the class of goods. The results of thus ignoring the standards set by the joint traffic association, whose classification is the result of long and dearly-bought experience in traffic matters, are easy to predict. Either the freight end of the business will be unsuccessful financially, or there will be a great deal of antagonism aroused when the necessary change to a sound basis of operation is made.

Needless Departures from Standards.

The inspection recently of the forms of reports used by the various electric railway companies indicates a tendency in present practice which we think is much to be regretted. The first work of the Accountants' association in the direction of standardization was to classify operating expense accounts, dividing them into 38 items. While any one company may be so situated that in the opinion of the management there is little for it to gain by classifying its accounts according to the recommended standard, yet in no instance can we conceive that any company would lose anything by so doing. By conforming to the recommended standard, although gaining nothing itself, there might be marked advantages for other companies which desire to make comparisons. No limit has been assigned, nor is it desirable that any limit shall be fixed, for the extent to which operating companies shall divide their expense accounts on their books, and if any useful purpose is to be served there can be no objection to showing the accounts as subdivided on the various reports.

Retain Reference Numbers.

At the same time, there is apparent no good reason why in subdividing, the names and numbers recommended by the Accountants' association should not be retained, denoting the various subdivisions by letters or by decimals following the standard number. In this way various roads are left free to go into such further detail as seems useful and at the same time the integrity of the system is preserved for those with whom comparisons may be exchanged, and the several sub-items under any one of the 38 standard accounts would retain the generally accepted reference number of the standard classification. This criticism of practice in accounting is directed more especially to those companies which operate railroads only. Companies which engage in a lighting business as well find themselves between two recommended standards, that of the railway accountants and that of the lighting accountants, which follow different policies. The railway accountants make the general division into maintenance and operation, each of which is subdivided to correspond to what in lighting work would be called manufacture and distribution, and the lighting accountants make a general division into manufacture and distribution and subdivide each of these into maintenance and operation. Even for companies engaged in both lines of business there is no reason why each account should not be provided with two numbers, and the practical identity of the American Street and Interurban Railway Accountants' Association standard be preserved. When there are so many necessary departures from convenient standards, it seems very unfortunate that unnecessary departures should be made.

High-Grade Men for Through Cars.

As the electric railway field broadens many questions arise that require no small amount of initiative to overcome. As the traffic increases one of the vital problems confronting an operating organization is that of obtaining competent men to run cars. This subject deserves the careful attention of all interested in both street and interurban operation. Never before have the conditions been as solicitous for unified action as at present. The operation of foreign cars over systems possibly already caring for fast local and limited schedules demands the best class of trainmen attainable. In the Street Railway Association of the State of New York a friendly unwritten law has been adopted among the operating heads of some of the member companies, which is a step in the right direction. Before a man claiming to have formerly been employed by a stated company is engaged for regular train service, his record is looked up. If it is found that he has previously been dismissed for negligence or carelessness he is rarely given a position. Cases of fraud and dishonesty are in a similar way traced. The companies which have united in this practice are obtaining satisfactory results and are gathering a very reliable class of employes.

Keeping Employes' Records.

At this time it may be wise to call attention to the early experiences of the steam railways which led to the practice now in vogue of keeping records of each trainman. A man whose record is thus kept, when once released for dilatory conduct or neglect of duty, may be placed in an embarrassing position if he seeks employment of another road. By this system the running of trains is, so far as possible, kept in the hands of reliable men and operation is correspondingly made more safe. This is one of the arguments advanced that the control and operation of electric railways by steam road organizations will furnish increased security of operation. Is it not possible for the managements of electric railways to build up just as strong and perhaps similar safeguards against the engaging of incompetent and unreliable men? It has repeatedly been found true that men released from steam service because of incompetency and later hired for electric train service, are often the cause of bad conditions that arise in electric car operation. If the operating heads of railways were in closer touch with each other this condition might be avoided. This seems to be a timely subject and one that must, sooner or later, receive the united attention of operating officials.

Maps and Timetables.

The returns following a judicious distribution of maps and timetables showing the location of railways and the time of arrival and departure of cars on connecting lines are becoming more generally recognized. In the larger cities of the central states, where extensive interurban properties are operated, station agents are called upon many times daily to route prospective passengers to distant cities. It is but natural that the routing will be, so far as possible, over the lines controlled by or affiliated with the home company. Beyond the limits of the home company's routes, however, the agent will no doubt to the best of his knowledge recommend the foreign lines that offer the best service to the desired destination. Easily obtainable knowledge of schedules and routes on foreign lines is of value to the local as well as the foreign lines, because prospective passengers are pleased when reliable information is at all times available, and thereby local and through traffic is induced. This subject has frequently been discussed in the smaller electric railway associations and efforts have been made in some notable instances to comply with the recommendations. However, there is still chance for improvement in the general supply of information that is placed at the disposal of the public. There are instances where maps, purporting to exhibit all the electric railways in a certain territory and which are issued as official, entirely ignore the lines of other companies not affiliated with them. It would seem that there are as yet hardly enough competitive electric lines in any territory to warrant the well-known steam railroad timetable tactics of showing the route by a straight heavy black line "the shortest distance between two points."

Plans for a Fogless London

One of the practical possibilities of electrical power consists in its use for heating, lighting and cooking purposes in cities far distant from the coal supplies near which the electric plant may be located. So vast a project as the abolition of smoke from the city of London by the substitution of electric power generated at mines 120 miles away, in lieu of the furnaces, stoves, coal grates and other smoke producers which now create the pall known as the London fog, is advocated by a member of the British parliament and receiving respectful consideration. The average energy to be supplied is estimated at about 1,000,000 kilowatts. While the practicability of so vast a project may be questioned the principle is being applied on smaller scale in connection with electric railway enterprises in this country and seems destined to large development.

Where Municipal Ownership Fails.

One of the most common arguments used by those who advocate municipal ownership is that the success of American cities in running their own water works is evidence that they could successfully run lighting plants, street railways, telephone systems and other public utilities. This argument is weakened by the greater simplicity of the methods of handling a water supply, the advanced state of the art and the fact that the need of water is the most common of all economic necessities. Nevertheless, a careful examination of municipal ownership of water works in different cities is apt to disclose many evidences of inefficiency and unbusiness-like methods, if not of actual corruption. A case in point is that of Seattle. That city recently voted on a project involving the expenditure of about $7,000,000 for the construction of a municipal street railway system. Yet, in spite of the fact that it owns a magnificent water supply capable of furnishing more water than could be used by double the present population, the incapacity of the city's management of the water system has brought about an actual scarcity of water at the present time.

The Necessity for Fire Protection.

Another disastrous car house fire, this time on the Boston & Northern system, emphasizes the immense importance of more positive precautions in the protection of valuable rolling stock housed in old buildings. In the Boston & Northern case, according to press dispatches, the car house was filled with rolling stock valued at about $250,000; the building was a one-story brick structure about 25 years old, and worth possibly $30,000, and other equipment valued at $75,000 was housed in it. All of this property except two short cars was destroyed, and so rapidly did the flames spread when the fire started in the small hours of the morning that the two employes on duty had no time whatever to devote to rescuing the imperilled rolling stock. There is little that is new in this situation, but there is no escaping the lesson which it teaches, the danger of housing rolling stock in anything but structures made as nearly fireproof as engineering science can specify. In the case cited the equipment lost was worth over ten times as much as the building whose primary function was to protect it. Even the brick walls were of little avail when the flames started, and the old wooden shed which supplemented the car house proper only added fuel to the flames. We have no data upon the fire protection apparatus which was installed in the car house, but it was of little avail. The question is, how can such fires be prevented in the future? Reinforced concrete car house construction probably comes as near absolute fire protection as anything yet produced by architects and engineers. Whenever it is possible to build a car house entirely of this material, with wired glass windows, standpipes and hose, extinguishers, sand pails and automatic sprinklers, fireproof doors and partitions, an operating company may be reasonably sure of its ground in the matter of fire risks.

Sectionalize the Car Houses.

It is a question if it will not pay in the future car house of this type to install movable fireproof barriers at right angles to the storage tracks, thereby splitting up the house into a number of pockets during the night, each pocket, for example, holding from six to twelve cars. It must be remembered that it is vitally important to confine a fire to the compartment where it originates, and unless the cars are protected by transverse as well as longitudinal portions, the damage may extend to serious proportions. The watertight compartment of the battleship suggests a similar fireproof sectionalizing of car house areas. If necessary, electric motors can be installed to open and shut the doors at will, or some sort of an asbestos curtain combination can be effected. Anyone who has been behind the scenes of a modern theatre during a performance must have noted the flexibility of the curtain control, and there is no reason why something of the sort could not be utilized in car houses at night, and rolled up out of the way in the daytime. The overhead wiring can be sectionalized as well as anything else. Critics of the policy of operating companies often fail to realize the impossibility of making sweeping physical improvements in equipment in a few months or even in two or three years.

Temporary Safeguards Against Fire.

A system operating three or four hundred miles of track cannot in the nature of things eradicate all of its old equipment with a single stroke of the president's pen, and for this reason it is unfair to condemn the policy of a company which is doing its best to improve its property by spending hundreds of thousands of dollars each year upon equipment changes. But there is no mistaking the importance of taking the best possible measures to protect old car houses and shops by keeping them scrupulously clean, prohibiting smoking on the premises, installing water pails, fire extinguishers and stand pipes, keeping the wiring in shape, adding a watchman or two, and the like. Even an incendiary fire—and the Boston & Northern's loss is suggested as due to this cause—should not be allowed to extend all over a car house. Compartment construction and the use of fireproof materials are the only sure remedies. Scores of electric railway car houses in different parts of this country are bad fire risks, and a wise management will replace these as fast as possible by improved structures. The more valuable the rolling stock housed under a single roof, the more it will pay to spend on its protection. The first cost of reasonable temporary protection in an old car house ought not to exceed two or three hundred dollars at the outside. It is too small an annual fixed charge to be passed by as beyond any road's resources.

Co-operation with Railroad Commissioners.

The Railroad Commission and the Street Railway Association of the State of New York are both to be congratulated upon their policy of harmonious co-operation. The recent meeting of the association at Albany emphasizes the fact that associations of railroad men can be of great assistance to the commission by frankly considering with them various questions which may arise, and at the same time they can avoid many causes of friction by securing discussion of the matter before the question is acted upon by the commission. Two questions which had been doubted before the New York association have been taken up at the request of the Railroad Commission. At the Saratoga meeting in June last the Railroad Commission requested that the association would consider the matter of the proper height of steps on electric cars inasmuch as the commission had received numerous complaints in regard to steps being too high. The report on this subject was made at the Albany meeting, suggesting recommendations as to the height of steps which, while calling for a higher step than railway managers could wish, yet were necessary because of the limitations of rolling stock design. After the points involved were fully explained to the representatives of the commission they were prompt to express their appreciation of what the association had done and to disclaim any intention to ask impossibilities or to make impracticable recommendations. The advantage to the railroads of such an attitude on the part of the commission is so apparent as to call for no comment. The same meeting afforded an illustration of how the association could be of real service to the commission. The subject of brakes was discussed at this meeting at the request of the Railroad Commissioners because the commissioners had found recently that the electric railway companies in their equipment were disregarding a recommendation which the board had been making for several years. A very full discussion developed that the railway operating and mechanical officials were unanimously of the opinion that the recommendation of the commission on this particular point had become obsolete by reason of the advance of the art in regard to the particular portion of equipment under consideration. Accepting this view, the commission asked for a formal expression of the association on the point, so that the commission might cite this authority when reversing its recommendation upon the point involved.

Lessons from Glasgow.

The fact that governmental operation of commercial enterprises invariably has resulted in the elimination of proper individual initiative and in the decreased deficiency of the personnel, with consequent increase in cost of operation, is the strongest argument that can be advanced against municipal ownership of public service undertakings. We are all familiar with the extravagant claims made for the success of sundry cities in the conduct of various public service plants and those acquainted with the literature of this subject have observed that nearly all writers and speakers in demonstrating the falsity of such claims lay stress upon the unscientific accounting of the municipalities in omitting such items as depreciation and taxes. The American cities which so persistently cite the Glasgow tramways as a successful municipal enterprise would do well to consider the thoroughly sound basis on which the accounts of that undertaking are conducted. Analysis of the report of the Glasgow Corporation Tramways for the last fiscal year, an abstract of which was published in the Electric Railway Review for September, shows that there was appropriated 20.69 per cent of the gross receipts on account of depreciation, this depreciation appropriation being in addition to 14.55 per cent of the gross receipts expended for ordinary maintenance and as such included in the operating expenses, which comprised 55.26 per cent of the gross receipts. Besides this charge for depreciation 5.89 per cent of the gross receipts was appropuriated for the sinking fund; 6.87 per cent for the payment of taxes and 4.44 per cent transferred to a general reserve fund. During the year in question there was spent out of the general reserve fund a sum equal to 3.60 per cent of the gross receipts for the year, which was used for extraordinary repairs and alterations. The city received 4.26 per cent of the gross receipts, this being equivalent to only 1.18 per cent on the capital invested.

Necessity for Complete Accounts.

The lessons which American municipalities should draw from the results in tramway operation in Glasgow are (1) how properly to keep accounts and (2) that a concern paying less than 2 per cent on the capital invested is not financially successful. The argument that municipal accounts are not honestly presented if such charges as depreciation, sinking fund and taxes are omitted is not vitiated by the fact that private corporations may themselves fail to show these items. If a corporation elects to ignore the effect of annual wear and tear and to postpone indefinitely the matter of meeting its funded debt, that is a matter to be settled between the directors and the stockholders. If this policy is persistently followed to the end there is bound to be financial suffering because of the continual financial improvidence, but the loss falls upon the few, and the individuals who suffer loss from this cause at least have the benefit of their experience to guide them in making future investments. The same disregard of the future in the conduct of a municipal enterprise results in loss to the whole community and is one against which the public cannot protect itself because the facts are concealed from it. With the whole truth set forth in the reports of municipal public service undertakings in this country, in no case would those responsible for the conditions as they exist dare to go before their constituents and seek continuance in office because of the showing that they had made.

Keeping the Cars Clean.

The Scioto Valley Traction Company has demonstrated that it is practicable and in fact easy to keep its cars clean. The road is fortunate in having twice as many passenger cars as are required in regular service so that the cars, as a rule, are used on alternate days only. After a day's run each car is thoroughly cleaned before being put in service again; it may be remarked that the cost of car cleaning, including labor, is just about one dollar per day for each car in service. At the end of each half trip, or oftener if necessary, the conductor sweeps out the car, removing all paper or other rubbish that may have been left by the passengers. Twice each day when the car arrives at the station in Columbus the cuspidors are removed from the smoking compartment and another set of clean ones substituted by a janitor who has this work in his especial charge. In both compartments of the car there are displayed extracts from state laws and city ordinances which prohibit spitting upon the floor, and the conductors are made responsible for the enforcement of these. At the first offense the attention of the passenger is called to the sign; if repeated, the conductor explains his instructions to the offender, and that further offense must result in ejectment from the car. If the conductor finds himself opposed by too much physical force, as has occasionally been the case when there were several disorderly men on board, his recourse is, at the next station where there is a policeman, to have the offending persons arrested. The police magistrates are in hearty sympathy with the efforts of the company in this direction and have imposed heavy fines, in a number of instances the maximum of $50. A year or more ago it was necessary to discharge two conductors because of their negligence in enforcing the rules to secure clean cars. Since these demonstrations of the earnestness of the management, it has not been necessary to discipline any of the employes for this reason.

Hollow Axles for Oiling Trolley Wheels.

Partial relief from the existing worrying and expensive trolley-wheel troubles is apparently to be obtained by the adoption of hollow oil-carrying trolley-wheel axles. In many sections of the country master mechanics of interurban railways are conducting individual experiments with the cylindrical axle that are showing more or less success, and each is enthusiastic over the results obtained. At St. Louis, Detroit and Ft. Wayne hollow axles designed to carry oil or light grease are undergoing the most severe tests. The method of keeping the oil chamber filled and the size and number of perforations used for allowing the lubricant to reach the bushing, varies, but in each case the tests show that the axle keeps the bushing, or point of bearing between the wheel proper and its axle, well lubricated. The axles used at St. Louis and Detroit have one end permanently closed and the other is provided with a screw plug which may be removed when the cylinder needs refilling. From three to six perforations are used to allow the lubricant free passage to the bushing. These perforations may be arranged in line or otherwise and may be set at any desired angle to the point of bearing in the wheel. The usual form is, however, to allow the axle to stand in such a position that the perforations will open toward the ground. In the experiments at the Ft. Wayne shops of the Ft. Wayne & Wabash Valley Traction Company both ends of the axle are closed with the exception of a small hole in one end through which a light graphite grease is forced by means of a force-syringe. In this case a slot 1x⅛ inch in size is provided at the under side of the axle, when the pole is in position, for the oil seepage to the bushing. Although no satisfactory data have been obtained as to the increased length of the life of the wheels equipped with this form of axle, it is agreed that the average car-mileage per wheel is greatly increased. The result of the numerous experiments will be watched with interest.

Advantages of Pole Line Consolidations.

Much popular agitation on the underground wire question might be eliminated if consolidating power or railway companies would standardize their overhead equipment and take down unnecessary poles as soon as feasible after the organization has been completed. We have seen instances of this sort where two or three separate pole lines have been allowed to remain on the same side of attractive residential streets, the poles sometimes coming so close together in groups of two or three as to barely permit the passage of the human body. These comments are in no sense intended as a brief for the municipality, but there is no doubt that a far-sighted policy is to harmonize all overhead work, especially after consolidations. Outward evidences of a company's good intentions are worth not a little at such times, when some one is always ready to whisper "Trust," even if two little four-car roads inaugurate a through schedule under a single management. The poles and fittings can often be utilized elsewhere to advantage, and the general improvement of the appearance of overhead circuits leads to both reliability of service and approbation by the reasonable members of the public. Street railways have expenses enough without paying interest and taxes on underground construction, except in great cities, where such methods can scarcely be avoided.

SUBSTATION IMPROVEMENTS.

In common with all power plant structures the alternating current substation has been notably improved in late designs, and in some of the most recent installations the layout of apparatus challenges even technical admiration. It is not many years since the cheapest wooden or brick building erected in any surroundings that had the single merit of low real estate cost was considered good enough for a substation, but in progressive electric railway and power propositions all these ideas are fast passing away. Substations like those of the Twin City Rapid Transit Company in St. Paul and Minneapolis, the Glenside and Sansom street installations of the Philadelphia Rapid Transit Company, those in Syracuse and Brooklyn, and others of the sort, furnish good evidence that the era of crude surroundings and indifferent construction is yielding to broader conceptions of architectural attractiveness and operating stability. There is scarcely any limit to the amount of embellishment that can be applied to substations and their surroundings, other than the canons of good taste, and the growing use of concrete construction with bush hammered surfaces, or their equivalent, wall recesses, tile roofing and grassed lawns is well calculated to stimulate the good will of the observing public toward the company which is far-sighted enough to add in its structures to the general appearance of the landscape. European designers are no longer to have a monopoly of the art of making an engineering structure look attractive to the eye.

On the operating side substations for railway and power service are now designed with a much clearer idea of convenient use than formerly. In approved installations we no longer see snarls of intricate wiring, switchboards backed up so close against walls that passage behind is at one's peril, machines scattered or aisles so narrow that only a man of slight build can traverse them in comfort. Greater consideration is being given to substation sanitation—in some recent plants the lavatory equipment equals that of the best hotels; expanded metal lockers and comfortable chairs are provided for the attendants, and the lighting and heating details are scientifically treated. The designer is coming more and more to look upon the substation as though he himself were going to work in it from eight to twelve hours each day. In some quarters the expense of making a substation a comfortable working place is still regarded from an acute angle, but in the majority of new installations the broad economy of the welfare treatment is fully appreciated. Sound-proof telephone booths, for example, are seldom overlooked in the design of a new plant, and the nerve-wearing strain of trying to grasp special and perhaps complex instructions in times of emergency through a telephone located in the midst of the moving machinery has been very largely eliminated.

In a few instances substation cranes have been fitted with electric motors in place of the usual hand operation equipment; small cranes of from one to two tons capacity have been installed to handle oil switch parts and instrument transformers, and small storage batteries have been introduced to operate remote-control switch mechanisms. Thermostatic alarms have been fitted to the upper coils of stationary transformers, to give warning in case of overheated oil; relief valves have been piped to the sewer connection to enable the oil of a transformer to be drained out in case of fire or other serious trouble, and transformers have been installed on wheels and tracks for the purpose of expeditious handling. The oil in a 1,000-kilowatt transformer may easily weigh nearly 3.5 tons, and the complete transformer 11.5 tons. An arrangement for drainage and prompt handling is therefore a valuable accessory in securing convenience of operation.

Automatic synchronizing is coming gradually into wider use, motor-driven air compressors with outlets for cleaning are frequently met in new substations, pilot lamps as switch portion indicators are widely installed, and the orderly arrangement of lightning arresters, oil switches, transformers, rotaries and switchboard panels is the rule in the more modern designs. The tendency is entirely away from erratic wiring, the idea being to carry the energy through the station in the most direct manner possible.

Many of these refinements may be looked upon as needless, but as long as simplicity of operation is sought in the arrangement and selection of equipment, there is little danger of over-improvement. From the standpoint of the single-phase motor enthusiast, the rotary substation is a costly and complicated affair, but it is still with us in large numbers, and the wisest policy is surely to make the best possible use of it as long as it remains. Doubtless there have been a good many remote-control switch installations which could have been made exactly as useful by the employment of old-fashioned manual control. The point of the matter is that these improvements are available to the progressive designer, and if conditions warrant it they should be specified. Any positive reduction of substation labor cost without too great a sacrifice of reliability is well worth considering.

CAR INTERVALS IN SMALL CITIES.

One of the most salient points of contrast between car service in small cities and that offered to the public on large urban systems is the relative infrequency of the rolling stock movement on any particular line of track which obtains in the less populous community. It is to be expected that a low density of traffic cannot support anything like the short-interval service found in large cities, but it is a question how far it is wise to go in the direction of lengthened headway. Intervals of 30 minutes on any important line in urban territory would seem to be about as long as the schedules should permit, and it is much to be desired that shorter headway be inaugurated if local conditions will allow it. A thorough study of the car routing and schedules from time to time is one of the most important pieces of work that the manager or superintendent of a small city road can set himself.

It is obviously unwise to run cars which are nearly empty over a line day in and day out, but without doing this it is sometimes possible to shift routes, or alter the meeting points slightly so that the headway will be reduced to 10 or 15 minutes on important lines. In small cities the car routes, instead of being numbered by the hundred, may often be counted upon the fingers of one hand, and it is a common experience to find all the cars bound outward or inward bunched at some central point twice every hour. This arrangement is a convenient one for the transfer passenger, but in the small city the transfer traffic is usually far less important than it is in the metropolis of the section, and from the standpoint of good railroading there is no good reason why the primary fare passenger's convenience should be set aside in favor of the relatively unprofitable free transfer rider. In other words, if the cars of two separate destinations traverse the same route over an important street in part of their journey, it would seem to be better to space them apart by a definite interval, rather than to pass them over the line simultaneously, as far as the point of divergence. Some such arrangement will modify the time-table so that a more frequent service will be given over the main lines, and it will incidentally benefit the load factor and the fluctuations at the power house—never too favorable on roads operating less than a dozen cars. The simultaneous starting of four or five cars in the center of a small town, and perhaps four or five miles from the power house as well, does not make for anything like smooth operation, and say what we will, it is the even load that makes high power-house economy possible.

The practice which sometimes obtains of starting two cars at the same time for the same destination instead of splitting the headway in two is scarcely to be commended from the standpoint of the best and broadest service. If the traffic is large enough to require the use of two cars in double-header operation, it would seem to be high time to introduce multiple-unit control train service, and reduce the transportation wages per train-mile accordingly. There is little advantage in operating street cars in a small city after the fashion of first and second section limited express trains on steam railroads.

It is not an easy matter to lay out a flexible schedule by mapping out car service on a single-track line, and the manager of the small city road is unusually handicapped by the absence of double trackage. In some cases, however, the installation of one or two additional turnouts will accomplish a great deal in the way of permitting more regular even-hourly fraction car movements, and again, it may pay to establish some sort of loop route over new street locations. The distances in small cities, say of 10,000 to 50,000 population, are now very frequently too great for walking—for a busy man, at any rate—but the extension of a route by a little additional divergence of location really adds very little time to the trip of the average car. Street congestion is generally absent in small cities, and a car will cover an additional square or block with very little delay.

The increasing passage of interurban cars through the main streets of cities of the class we are considering often makes it possible to intersperse their transit of the community with the local car movement. Thus, an interurban car may pass through the main street of a small city on a half-hourly interval, and the local system's car should preferably follow the interurban—and also lead it—by 15 minute spacing, instead of trailing along after it on practically the same schedule. Local passengers are prone to ride upon through cars whenever the stops are frequent enough to make it feasible, and for this reason the local cars are certain to be better loaded in any live community if they space the interurbans by 15-minute gaps, or by 5 or 10-minute intervals, in case the interurban headway is shorter than 30 minutes.

It may be urged in some quarters that a car service of 30-minute headway, or 20-minute intervals, is adequate for any city of the class specified. Doubtless this is true for the less important lines traversing mainly residence streets, but there is no question that a shorter interval is a powerful factor in the stimulation of business activity in a small city. No figures are at hand to evaluate the effect of disposing schedules so as to give a 10 or 15-minute service on the main business streets of a community which had previously been served with 20 or 30-minute cars, but any visitor will be quick to state that the "live town" of the two is the one with the more progressive and thus more frequent car service. Certainly an advertised extra car can be operated now and then, on certain days, to enable the street railway management to judge the effect of the more frequent car movement. There is no denying the fact that a good many prospective passengers will walk in preference to waiting half an hour for a car, when a 15-minute gap would not be considered a serious obstacle to waiting.

The analysis of the traffic of a street railway is one of the most important subjects which the managements have to deal with, and it deserves quite as much attention as do questions of line loss, track bonding and power production. It is seldom realized by the manager of a road operating on long intervals how keen a competitor he has in the telephone. That instrument has its impressive limitations, but it is an active rival of the trolley car, even in small cities. The relation of car intervals to traffic is not a subject in these days to be dismissed with a mere wave of the hand.

TESTING ELECTRIC RAILWAY SUPPLIES.

The testing of materials and supplies is one of the most important duties performed in the mechanical administration of a great railroad property, and only in less degree is this work essential to the well-being of smaller systems, regardless of the type of motive power used. Many electric railways are large consumers of the raw materials used most commonly in construction, as well as heavy buyers of certain industrial products, wood, iron, steel, cement, oil, paint and a multitude of other substances are constantly in demand on even a medium-sized trolley system, and it is a matter of far-reaching consequence that the quality of these materials shall definitely be established. The reputable manufacturer has nothing to fear from tests by the consumer, made for the purpose of determining the degree of adherence of shipments to specifications, or with the object of finding out the materials and supplies best adapted to any given service requirements.

Ordinary inspection is rarely sufficient to determine the quality of any given material. Both physical and chemical tests are frequently necessary. The calorific power of coal, for example, can only be ascertained by actually burning a sample in an approved calorimeter, or by chemical analysis, though a very rough check of coal quality is possible by the expert interpretation of power-house records. The analysis of the constituents of a paint is most essential before a correct prognosis of its durability can be made; the linseed oil should be pure and not adulterated with fish oil, mineral oil or corn oil, and turpentine must not be saturated with benzine. The larger the road, the more costly become the results of inferior products applied to the work of maintenance, and the more it will pay to obtain standard materials based on scientific acceptance tests. It is often urged that a small road cannot afford to pay for tests of this kind, but there is no reason why several roads in the same territory should not co-operate in meeting this expense, whether it be incurred at a manufacturer's plant, in a commercial laboratory or on a company's own property. A road of moderate resources naturally shrinks at the cost of fitting up a testing department or even of employing an engineer skilled in the production of test analyses, and when such a company operates in a territory remote from the denser areas of population, the expense of employing an outside expert looms up in no uncertain bulk. Co-operation between different roads is coming to be more and more the rule, with the interchange of cars and through route service now given in many localities, and a little mutual discussion of the physical requirements of each property will often enable several roads acting together to purchase a quality of expert advice or other professional service which would otherwise be prohibitive in its cost to the individual line.

The exact nature of the tests of materials and supplies which it is desirable to make naturally varies a good deal with the conditions. A large system can afford to pay the cost of one or two extra decimal points in getting at the minute particulars of its supplies, for the reason that the quantity used is so large that the inspection and cost per unit is very small. A slight inferiority in the quality of a single piece means a substantial loss in the consumption of several months' purchases, and it is worth saving this, if simple tests can point the way.

Steel is one of the most important materials used by electric railways, and whether it appears in the form of axles, rails, splice bars, springs, castings, forgings or structural shapes, careful tests ought to be made of the quality furnished whenever it is possible. Besides the chemical analysis to determine the percentage of sulphur, phosphorus or other deleterious substances present, physical tests of tensile strength and ductility, microscopic examination of fractures, and a bending test after quenching to weed out brittle specimens are well worth while. Drop tests upon wheels—allowing a given weight to fall a certain number of times from a known height upon the wheel—and also upon axles, may not duplicate the shocks of service operation upon rough track with a loaded car, but they at least serve as a basis of comparison. Rails may be satisfactorily tested, for example, by allowing a weight of one ton to fall a distance of 20 feet, striking the test rail midway between two supports four feet apart. In a recent paper before the Franklin Institute, Mr. Robert Job of the Philadelphia & Reading Railway states that a test like this speedily shows whether the rail is brittle and unsafe for use or not, for in case of defects the 40,000-foot-pound blow breaks the rail, sometimes into splinters. The microscopic examination will show whether or not the steel received proper treatment at the mills.

The analysis of waste packing for bearings, the determination of the flash and fire points of oils, and the fitness of different kinds of oil to different machines should all be carefully determined in testing supplies. Some of the questions can only be settled by using the supplies or materials under the cars or in the shops, but once a satisfactory commercial performance is secured, it is certainly the part of wisdom to find out the physical and chemical properties which contribute to the desired result, so that pieces falling below the standard in the future can be thrown out without the delay of service use, and with greater safety to the patrons of the road in many cases.

The testing of airbrake hose is a point of growing consequence upon electric railways, no less than an essential feature of the best steam railroad practice. It is not too much to expect a piece of air hose to withstand a pressure of from 350 to 400 pounds per square inch, and it is highly desirable that the rubber shall not have its life shortened by the presence of shoddy, mineral matter, paraffine or tar. No maker of good reputation will object to any reasonable tests of this character, which only serve to discredit the inferior product and assure the railway manager that he is getting the full value of his contract. Mr. Job pointed out that the presence of boiler scale one-eighth of an inch thick increases the fuel bill 22 per cent in the operation of a locomotive boiler, and this lesson may well be taken to heart by the electric railway man. Periodical analyses of boiler water are comparatively inexpensive to secure, and it is certainly as important to study the effect of the water supply upon the tubes and flues as it is to go over the rail bonds in search of high resistance joints.

Copper wire ought to fall within certain definite standards of resistance, and its insulation should be up to the specified quality before acceptance. The testing of cement is a matter of serious moment in the event of reinforced or plain concrete structures being placed in service, for if the cement is inferior the concrete will disintegrate and weaken, to the possible failure of the entire structure.

Tests of the above indicated character should in no sense be confounded with the acceptance tests ordinarily made upon complete machines purchased by a road. These latter are much more generally considered important, but the material test is a larger factor in the maintenance cost of a road than is appreciated in many quarters. There is always the possibility, even in hum-drum routine tests upon ordinary supplies, of bringing to light some characteristic property of the material which may result in the saving of many hundreds if not thousands of dollars in a year upon the system. Conditions of operation tend to change; new demands are made upon rolling stock and permanent way equipment no less than upon power house and distributing systems. The combinations of materials which will give the best and most economical service are a never-ending source of study to the testing engineer. The laboratory and the electric railway are certain to come into increasingly close relations as the operation of all transportation systems becomes more and more a scientific problem in commercial engineering.

IMPROVEMENTS IN SWITCHBOARD WIRING.

Thoroughly satisfactory progress has been made in switchboard wiring during the past few years, particularly in the case of alternating-current panels. The direct-current, 600-volt railway switchboard has perhaps changed as little in appearance during this time as any other type of panel groups, but even here one notes a most pleasing tendency to avoid crowding of apparatus and connections. The existence of heavy busbars and ammeter shunts, copper connecting traps, switch and circuit-breaker terminals renders it difficult in designing a 600-volt railway switchboard to provide the clear working space in the same width and height that is possible in a low-potential alternating panel. At the same time anyone who takes the trouble to compare an old and a new board, particularly behind the panels, must be impressed with the gain in mechanical construction and increased insulation offered by modern switchboard practice.

The electric railway man is today quite as much interested in alternating-current switchboards as he is in direct-current panels, and in view of the fact that the cost of the switchboard today represents in many installations a very considerable percentage of the total plant cost, it is well worth noting the quality of design and workmanship which is responsible for the increased investment necessary. The expenditure of from $10,000 to $20,000 for a switchboard would not be justified unless the apparatus delivered represented a greatly increased superiority of construction over the older equipment.

These improvements lie chiefly in the direction of increased safety of operation, flexibility of control and ease of inspection and access. Designs vary with conditions, but there is everywhere apparent an effort to protect the operator even against his own mistakes. Hence we find the high tension busbars taken entirely off the rear of the board in many cases and housed in concrete ducts or chambers entirely inaccessible to casual contact. The Old Colony Street Railway Company's plant at Quincy Point, Mass., illustrates this construction admirably. Again, the high tension busbars are now very frequently supported in horizontal parallels over the space behind the switchboard and the nearest wall, instead of on the actual rear of the panels. Still another construction covers the busbars with high-grade wood boiled in paraffine or in some other way treated to insure its stability of insulation. With very high voltages all dangerous wiring is removed from the rear of the switchboard, and the control effected by remote switches and small motors.

The separation of the oil switch from the panel, or at least its rigid insulation of voltage like 2,300 or 1,100, has robbed switchboard operation of most of its dangers for attendants, and has added much to the flexibility of the equipment. The general removal of field rheostats to the basement ceiling below the switchboard, or to an equivalent out-of-the-way spot has also improved the conditions as to space available for other operations. This means, as in the plants where motor-operated oil switches are installed in compartments operated from the main board, greater flexibility through the space released for double-throw controlling mechanisms, and better facilities for inspection. Station auxiliary panels are also coming more and more into vogue, instead of wiring this class of equipment to switches scattered all over the plant. Coal conveyor and crusher motors, valve-motors, pump and fan motors fall under this class, as well as the sectionalized lighting circuits which supply the different departments of a large power house.

The reduction of the density of apparatus on the rear of the switchboard greatly facilitates inspection and repairs. This is an important consideration when for any cause the service is interrupted. Still another factor in the improvement is the increasing use of horizontal and perpendicular, instead of angular, runs of wire for instrumental, lighting and other purposes. On such a board there is nothing like the difficulty in following out the connections which used to be found in the intricate wiring puzzle schemes of the older days. Some of the later switchboards are equipped with testing jacks which enable instruments to be calibrated without tearing down or opening the regular service connections. Both the front and rear of the modern high-class switchboard exhibit increased beauty of appearance and adaptability to the service for which the panel was built. Simplicity must be secured by separation in such structures rather than by elimination.

THE UTILIZATION OF FINE COAL.

The large proportion of fine coal which necessarily accompanies the mining of all kinds of coal has for a long time called for some successful manner of utilizing this extensive waste. The huge culm piles which surround every breaker in the anthracite region testify to the careless methods employed in preparing anthracite in previous years. About 20 years ago the legislature of Pennsylvania appointed a commission to investigate the extent of this loss of mineral wealth and it was the beginning of the work which has since resulted in the utilization of a large portion of this fine coal.

The method employed in burning fine anthracite depends upon three distinct processes: First, washing, which removes a large part of the slate and non-combustible matter; second, screening to uniform size; and third, the use of the undergrate blast. By the use of such methods fine anthracite so small that it is known as "rice" and "birdseye" can be burned with good results. It is evident that if an attempt is made to burn such fine coal with ordinary chimney draught, it would pack solid on the grate and the air necessary for combustion would not pass through it. With the undergrate blast the air is forced through the fine fuel and the pressure of this blast is so graduated that it keeps the fine particles floating almost like corn in a popper. In this way the proper supply of air is secured and this fine anthracite is successfully utilized.

For soft coal the problem of getting useful fuel out of the finer grade is more difficult and it has been attacked in a number of ways. With coking coals it is easy to use the fine coals mixed with the lumps in the coke ovens and thus obtain good quality of fuel in the form of coke. Another method on which a large amount of experimental work has been done is that of briquetting, and so far as the mechanical operation is concerned a number of successful machines have been designed and are in use in this country. The cost of making briquettes is, however, the principal objectionable feature, and it is largely a commercial problem as to just where briquette machines can be profitably used for the utilization of fine bituminous coal.

The improvements in automatic stokers for steam boilers have reached a stage where they will handle fine bituminous coal successfully, and a large tonnage of slack and small screenings is now utilized for steam purposes by the use of automatic stokers. It cannot be said that this is a very economical method, as the fine coal contains a large amount of ash and the rate of evaporation obtained by it is quite low. There is the expense of handling a large quantity of material which is not fuel and also in dealing with the large proportion of ash which results from its combustion. The fine coal packs on the grate and the presence of a large proportion of ash is not only harmful because of its lack of heating value in the ash, but because it obstructs the free passage of air through the bed of fuel.

In 1905 the production of bituminous coal in Illinois and Indiana amounted to 50,000,000 tons and nearly one-half of this was screenings. It is probable that 20,000,000 tons of fine coal were sold at a price below the cost of production and the average efficiency of this kind of fuel was less than 50 per cent. It is only the enormous extent of the coal fields in these states and the ease and low cost of mining which would permit of such wholesale waste continuing through an era when the waste material of former years in most other industries is carefully utilized. The use of air under pressure for the combustion of fine anthracite would suggest a means of burning fine bituminous coal more successfully than is usually done by the ordinary method of a grate fire. As the coal is already in a fine state of subdivision it would seem a natural thing to reduce it to a uniform fine powder and burn it in this way almost like a gas. The material can be handled entirely by machinery, and there is no expense for stoking. Like gas fuel, also, the impurities are almost entirely consumed and there is little or no labor required for the removal of ashes. While numerous attempts have been made to use pulverized fuel, the process does not seem to make much progress, and the only place where it is largely employed is in the cement region of Pennsylvania.

The University of Illinois has an engineering experiment station and Prof. L. P. Breckenridge has made numerous experiments with fuel and boiler appliances at that station. In the bulletin issued by this University we are told that "from broad economical considerations wasteful methods of using coal or the rejection of any combustible part as waste should be discontinued and exhaustive and careful experiments will be required before the best conditions can be attained. These experiments must include the best methods of burning Illinois coal, the effect of various methods of preparation and various kinds of furnace construction." Pulverized fuel would naturally be included in this series of experiments and we trust that the University of Illinois will soon commence some useful work in the direction of utilizing fine bituminous coal by burning it in a pulverized state.

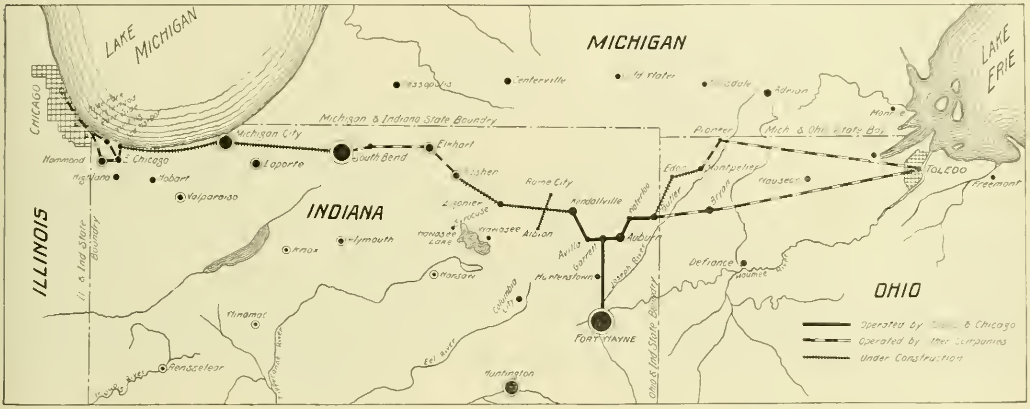
The United States Geological Survey in its experimental station at St. Louis has been conducting tests with briquetting machines in the effort to utilize fine bituminous coal and these experiments have been carried to an almost successful conclusion. It would now appear that pulverized fuel should occupy the attention of the commission, and we trust that some work of this kind will be done at St. Louis during the coming year.

Italian Electric Railway Project.

According to recent reports, an Italian syndicate has applied to the Minister of Public Works for a concession for a 120-mile electric road from Rome to Naples, which will be covered by express trains in one hour and forty minutes. These trains will run direct between the two cities with but few stops. The regular fast trains will cover the distance in about two hours. Hydraulic power is to furnish the current, and it will be taken from the Volturno river or its affluents. The concession is to be held for a period of 70 years, after which the line will be turned over to the government.

THE TOLEDO & CHICAGO INTERURBAN RAILWAY.

The new single-phase line of the Toledo & Chicago Interurban Railway, recently opened for passenger and freight traffic in northern Indiana, is an excellent example of a well-built electric railway constructed throughout by its owners. The present lines as now operated are 40 miles long, and definite plans are laid for a completed system of 100 route miles, connecting the termini of existing electric railways extending from Toledo and Chicago toward northern Indiana. It is expected that next season the present lines which now connect Ft. Wayne, Auburn and Kendallville, Ind., will be extended from the latter named town to Goshen, with spurs to Albion and Rome City, Ind. An existing line of the Northern Indiana Railway Company connects Goshen with South Bend, from where two lines are being built toward Chicago. An extension of five miles from Auburn to Waterloo is now nearly ready for operation. A future extension will connect Waterloo with the Toledo & Indiana or the Toledo & Western at the Indiana-Ohio state line.



Toledo & Chicago Interurban Railway—Map of Route and Connections.

Toledo & Chicago Interurban Railway—Standard Three-Compartment Single-End Car with Single-Phase Equipment.

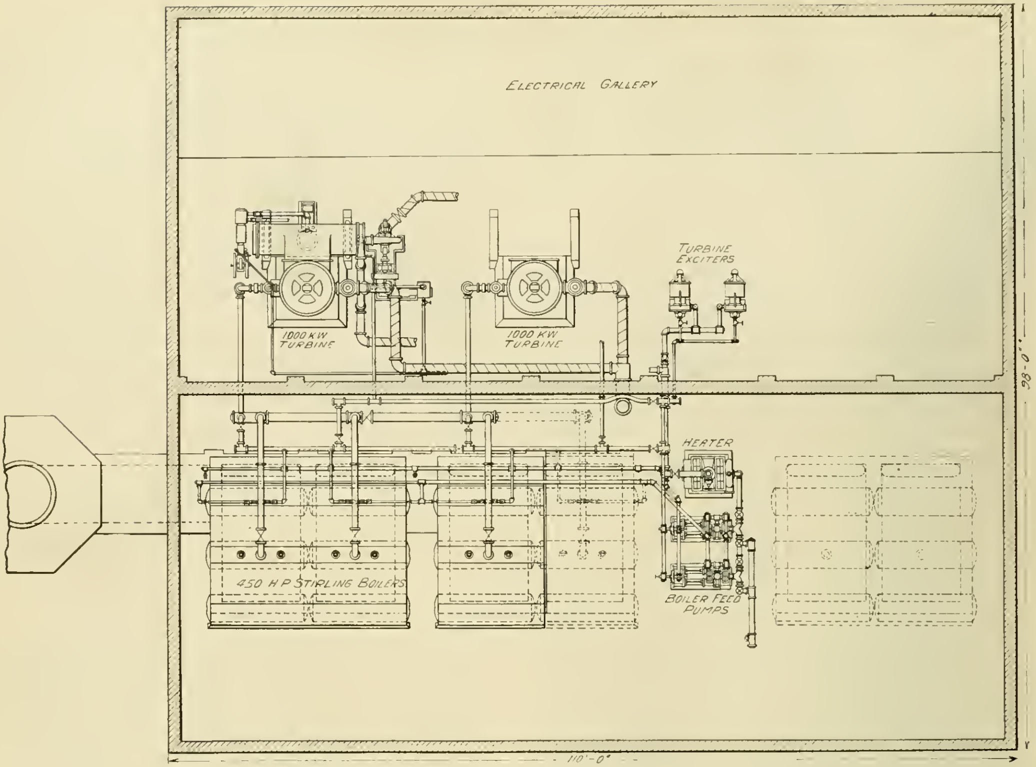
The officers of the Toledo & Chicago Interurban Railway are A. B. Shepard, president, Cleveland, O., F. B. Perkins, vice-president, treasurer and general manager, Kendallville, Ind., and F. L. Welsheimer, secretary, Auburn, Ind. None of the bonds or stock of this company have been placed on the market, the Trust Company of America being trustee for the bonds. All the construction work has been carried on directly by the owners under the personal supervision of Mr. F. B. Perkins, general manager. Those financially interested in this railway have recently incorporated a company to be known as the Indiana Light & Power Company. The plans for this organization include the sale of current for light and power purposes in the towns served by the new electric railway.

Track and Roadway.

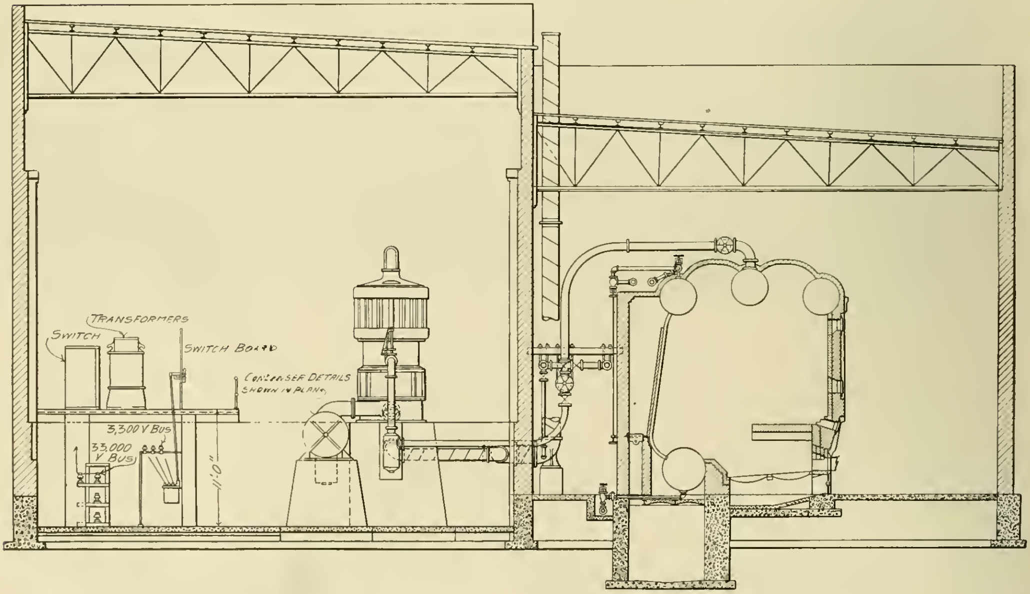
The line as now operated extends from Ft. Wayne, where excellent freight and passenger terminal facilities are had, north to Garrett, 20 miles, passing through Hunterstown. From Garrett the line branches east five miles to Auburn, which branch will soon be operated five miles farther to Waterloo, and northwest 12 miles to Kendallville, passing through the town of Avilla. These branches will later serve as a link in the through route between Toledo and Chicago.

The roadbed is built on a fenced private right of way from 50 to 100 feet wide for the entire distance except through the towns of Waterloo and Garrett. The entrance to Ft. Wayne is made on a private right of way extending from the city limits, two miles toward the center of the city. No franchise for operation in streets is for less than 50 years and some are perpetual, all permitting the hauling of standard freight cars for any class of traffic.

There are no large bridges, the concrete arch shown in an accompanying illustration being the largest. Drainage under the subgrade is afforded by cast iron pipe and concrete culverts. The maximum grade is 1¼ percent and the curves have been limited to 10 degrees except in the town of Garrett, where there is one of 400 feet radius and in Auburn one of 250 feet radius. The crossings with steam roads comprise, one under the Baltimore & Ohio at the general grade of the electric tracks, a similar crossing under the Grand Rapids &



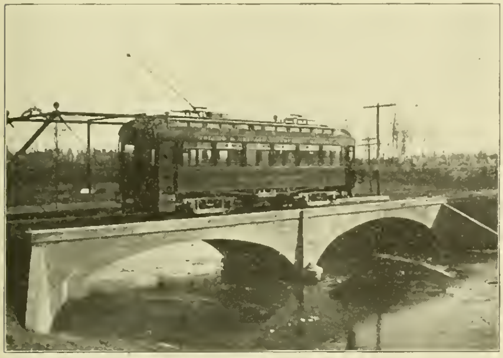
Toledo & Chicago Interurban Railway—Floor Plan of Power Station at Kendallville.



Toledo & Chicago Interurban Railway—Sectional Elevation of Power Station at Kendallville.

Indiana at Kendallville, and grade crossings with the B. & O., Lake Shore in the town of Auburn, and the Vandalia south of Garrett. The electric tracks are connected with those of the G. R. & I. a short distance from the power house at Kendallville, and with the B. & O. at Auburn.

The track is laid with 70-pound T-rail joined by special section angle bars designed to afford more than the usual clearance. Each rail joint is bonded with one No. 0000 General Electric expanded-terminal bond. The ties, mostly cypress and oak, are spaced 3,000 to the mile and rest on gravel ballast.

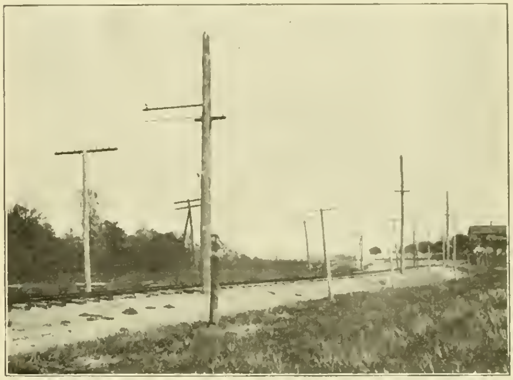


Toledo & Chicago Interurban Railway—Single-Track, Reinforced-Concrete Bridge near Auburn Junction.

Overhead Construction.

The cars are operated with 3,300-volt, 25-cycle alternating current distributed by a catenary-suspended trolley wire, the trolley being fed at various points by transformer stations taking current from a 33,000-volt transmission line. The average line loss for the distribution system does not exceed two per cent.

Chestnut poles 35 and 40 feet high with 7-inch tops and set 100 feet apart support the overhead work. The trolley brackets are made of two-inch pipe and each has at its outer end an iron pin clamped about the bracket pipe and supporting a Locke porcelain insulator. These insulators carry in their top seats a ⅜-inch Roebling special steel messenger or catenary cable which has been tested to 7,000 pounds. The grooved trolley wire is supported in a horizontal position by hangers from the messenger cable spaced 50 feet apart on straight track. Clamp ears are used. With this type of trolley support it has not been thought necessary to head-anchor the line except at the ends of the lines. Standard G. E. lightning arresters are spaced two to the mile and grounded to plates and track rails.



Toledo & Chicago Interurban Railway—View Showing Construction on Curves.

On curves the trolley wire is held in place by pull-offs consisting of rods of specially treated wood reaching from the pole to the wire. On sharp curves such sticks are placed 18 inches apart to give the wire an easy curve.

The 33,000-volt high-tension line consists of two No. 4 hard-drawn copper wires carried on Locke, 9-inch, triple-petticoat insulators cemented on 14-inch iron pins at opposite ends of a cross-arm 4 by 5 inches by 6 feet in size. This line is not transposed. For lightning protection there are arresters in the power house and substations.

The telephone line consists of No. 9 iron wire transposed every other pole by supporting one wire on the cross-arm and one on a bracket.

Generating Station.

The power station at Kendallville is a red brick building of pleasing design, 110 by 98 feet in floor area. A fire wall divides the interior space longitudinally into an engine room 48 feet clear to the base of the roof trusses and a boiler room 35 feet clear to the roof structure. The engine room is served by Northern crane of 24,000 pounds capacity.

The present boiler equipment consists of three Stirling

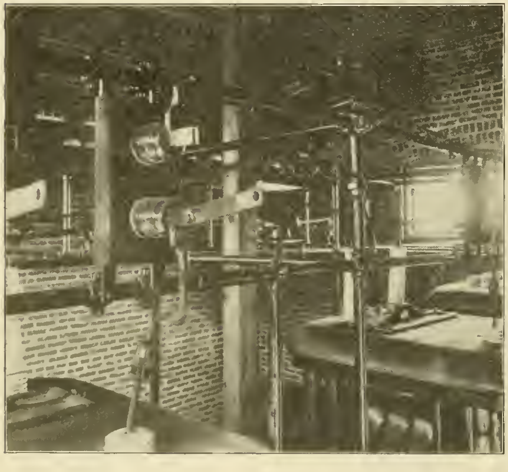
Toledo & Chicago Interurban Railway—Gravel Pit and Work Train.

units of 450 horsepower (rated) each, set one singly and two in a battery. Steam is generated at 165 pounds pressure. This equipment and the auxiliaries occupy but one-half of the boiler house, the other portion remaining available for future units. The boilers are hand fired.

An underground smoke flue connects with a self-supporting steel stack 100 inches in clear diameter and 163 feet above the boiler-room floor. The interior of the stack is lined with brick to a height of 50 feet. The stack rests on a concrete base 20 feet square and 20 feet deep in the ground. Above the surface of the ground the concrete has the form of a hexagon 3 feet high and 18 feet across.

Toledo & Chicago Interurban Railway—Transformer Station at Garrett.

The live steam header is back of the boilers, in the boiler room. This header and its branches are so sectionalized that either turbine can be fed independently with any one, two or three boilers or each turbine can be fed from all the boilers. The connections to the turbines are taken from the underside of the header, led through the partition wall and brought up to the throttle valve from below. The high-pressure piping is drained to an Anderson steam trap. There are two independent high-pressure auxiliary steam mains, each arranged to feed the 25-kilowatt exciter units, boiler feed pumps and other auxiliaries. Any one or all of the auxiliaries can be fed from either main as desired.



Toledo & Chicago Interurban Railway—Cut-Out Switches and Connections in Transformer Station at Garrett.

Toledo & Chicago Interurban Railway—Track and Pole-Line Construction on Tangent.

The boiler feed pumps discharge to the boilers over independent lines which can be cross-connected. There are two of these pumps, each of the Laidlaw-Dunn-Gordon type, duplex, outside packed, with cylinders 12 and 7 by 10 inches in size. A Cochrane open heater of sufficient size to supply six boilers utilizes the heat from the auxiliary exhausts for raising the temperature of the boiler feed-water.

The service water is drawn through an 8-inch galvanized spiral riveted pipe leading to an outside cistern which is filled by gravity from a spring-fed lake about 600 feet away from the power house. The house water supply is handled by a 4½ and 6 by 6-inch Laidlaw-Dunn-Gordon outside-packed duplex pump taking its suction from the boiler-feed intake and discharging to a galvanized iron tank located in the

Toledo & Chicago Interurban Railway—Interior of Generating Station at Kendallville During Construction.

boiler house near the roof. From this tank water is supplied to the pressure pumps for the turbine step pumps in the engine room.

As shown by the power house plan and elevation each of the two turbine units has mounted near its base a Worthington condenser. Each unit has an air pump of the same make. Condensing water is supplied each unit by a rotary pump driven by a Russell engine. This water is taken from an 18-inch riveted steel pipe leading from the well earlier mentioned as being fed from the nearby lake. The discharge is returned to a similar well from where it flows by gravity to the lake. The relative elevation of the well, condensers and pumps is such that the pumps are called upon to work against only about a four-foot head. The condensed steam from each condenser is forced to the heater by a rotary pump driven by a three-horsepower, three-phase motor.

The generating equipment consists of two 1,000-horsepower Curtis turbine units generating three-phase, 25-cycle current at 3,300 volts pressure. Exciting current is furnished by two turbine driven units consisting of a single stage horizontal Curtis turbine driving a 25-kilowatt, 125-volt, 2-pole generator at a speed of 3,600 revolutions per minute.

There are four Worthington, duplex, outside-packed 1½ and 1½ by 4-inch pumps which maintain pressure for the turbine step bearings. A pressure of 250 pounds per square inch is needed for this duty. To avoid any loss of pressure from an accident to one of these four pumps they are so connected that any one can feed water to the bearing of either turbine. There are two Blake oil pumps for the main units, each with cylinders 3 and 2 by 3 inches.

Toledo & Chicago Interurban Railway—Auburn Junction Showing Trolley Suspension at Sidetrack.

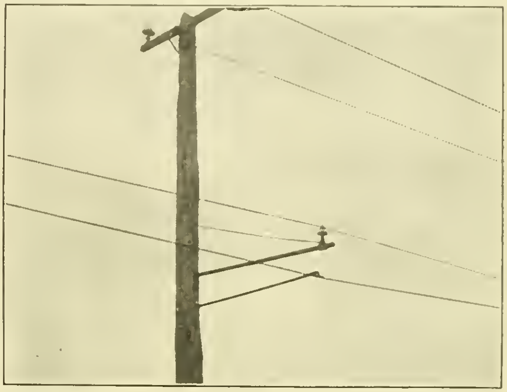
The current from the generators is led to a set of 3,300-volt, three-phase busbars. From these busses one phase is tapped to feed the immediate sections of the trolley wire. Current from another phase is stepped up by three 325-kilowatt transformers to 33,000 volts pressure and distributed to the transformer stations along the line, where it is stepped down to 3,300 volts pressure to feed the trolley wire.

The transformers and switchboard will when the plant is completed, stand on a gallery along the side of the engine opposite the turbines, the switchboard operator being at about the same height as the generators. The switchboard will include 2 machine panels, 2 exciter panels, 1 panel with for two 33,000-volt transmission lines, 1 panel for cutting the transformers on and off the 3,305 volt bus, 3 panels for 33,000-volt side of transformers, and one panel for each of the following: blower sets, station lighting, Tirrell regulator.

The complete steam plant was designed by the Arbuckle-Ryan Company, of Toledo, O.

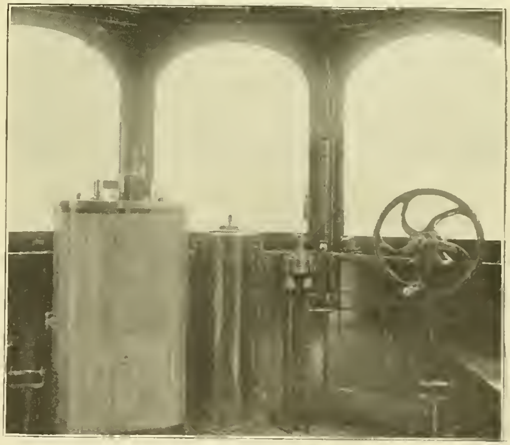
Transformer Stations.

For stepping down the line pressure to that of the trolley wire there are at present two transformer stations; a third will soon be erected. The first station is ten miles from the power house, the second is ten miles farther on and the third will be on a branch ten miles from the second.



Toledo & Chicago Interurban Railway—Near View of Bracket Construction on Curves.

Each station has its apparatus so arranged that the operation can be taken care of by a station agent. The buildings are of brick and concrete with slow-burning roof construction. The high-tension current is stepped down at each station by two 240-kilowatt, 33,000—3,300-volt oil-cooled transformers. There are two switching panels; one panel controls the oil switches for the line side of the transformers and the other panel controls two 3,300-volt feeder circuits. The high-tension oil switches are set in separate fireproof compartments. The wiring for the switch and transformer connections is carried on standard line arresters supported by a pipe-rack. The circuits on both sides of the transformers may, in emergency, be opened at knife switches which are provided.



Toledo & Chicago Interurban Railway—Interior of Front Vestibule Showing Control Apparatus.

The transforming station at Garrett has 33,000-volt switches and connections for handling two outgoing feeder lines to the other stations.

Rolling Stock.

At present cars are operated on two-hour headways over both branches. This arrangement will probably be continued through the winter.

The rolling stock includes six 52-foot single-end three-compartment cars built by the Niles Car Company. The seating capacity of the main and smoking compartments is sufficient for 50 passengers. The interiors are finished in oak and no space is available for advertising. The cars are mounted on Baldwin heavy interurban trucks with steel wheels having 3½-inch treads and flanges one inch high.

Each car is equipped with four 75-horsepower General Electric alternating-current direct-current motors geared to 40 miles per hour, with platform control. The apparatus includes a 100-kilowatt transformer with taps taken off at coils furnishing current at pressures at from 400 to 800 volts. Damaged motors may be cut out by means of a commutating switch at either end of the car and under the floor. Twenty-four lamps of 16-candlepower each are wired to the 600-volt tap of the transformer.

Toledo & Chicago Interurban Railway—Exterior of Power Station at Kendallville.

There are also two 45-foot double-end cars with similar motor equipment, for local service, two 52-foot express cars and one locomotive with the same motors and control. The rolling stock also includes standard flat and box cars.

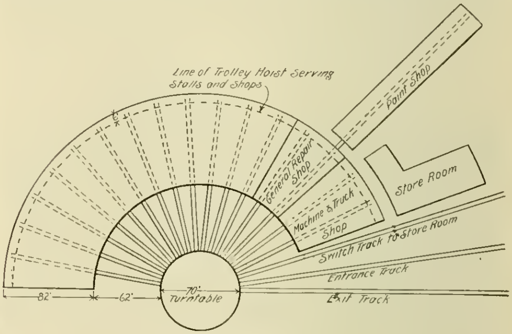
The road is fully prepared to handle freight in carload lots or as package freight. The company has a terminal and freight yard in Fort Wayne and local stations in each of the towns on the route.

The plans for the near future include the erection of a car storage and shop building on the power house property at Kendallville.

The Northwestern Elevated Railroad of Chicago carried 77,508 passengers during the month of September, as compared with 74,307 for the corresponding month in 1905, an increase of 4.3 per cent.

PROPOSED SHOPS AND STORAGE HOUSE DESIGNS FOR SCIOTO VALLEY TRACTION CO.

The Scioto Valley Traction Company is preparing designs for car storage house and repair shops and has decided to adopt the roundhouse plan for the reasons that it is slightly cheaper in construction than the ordinary rectangular car house for a given capacity, that it will be much more flexible in regard to making additions when necessary, that the roundhouse with a stall for each car with tracks radiating from a turntable eliminates all the special track work needed for entrance purposes and makes every car accessible without any switching in the house or yards. The roundhouse and shop buildings will be built about a turntable 70 feet in diameter. A turntable of this size affords space for 44 tracks, about twice as many as would be needed at the present time, and the first layout will cover only one-half the circle. The roundhouse is to be 79 feet inside and the concave wall 62 feet from the turntable, making the radius of the outer wall of the roundhouse about 180 feet. According to the plan proposed one track would be used for an entrance to the turntable, one for the exit, and one for a switching track to serve the storehouse. The portion of the building corresponding to three tracks would be equipped as a machine and truck shop and the next section corresponding to two tracks equipped as woodworking and general repair shops, leaving 14 stalls for car storage and inspection. Back of the machine shop, on an extension of the radius through it, will be located the storehouse and master mechanic's office and, similarly, back of the general repair shop, is to be the paint shop. An overhead trolley, running concentric with the outer wall of the building and six feet from it, will afford means for transporting machinery from the car stalls to the shops.



Proposed Storage House and Shops, Scioto Valley Traction Company—General Plan.

A Catch-Dollar Scheme.

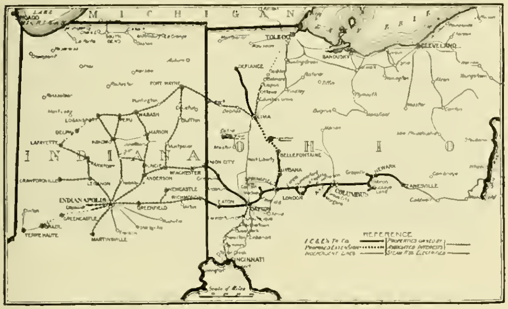
The Wall Street Journal prints the following question and answer applicable to more than one scheme of the kind:

What is your opinion of the proposed electric line from Chicago to New York, supposed to be under construction at the present time, and in which scheme stock is being offered at $25 for a $100 par value share? Do you consider the stock a good purchase?—L. T. W.

Answer.—Prominent railroad engineers have given the question of an air-line road from Chicago to New York serious consideration, and a practically unanimous verdict has been rendered that the scheme is impracticable. Did the plans look feasible to the large financial interests, the offering of stock at 25 cents on the dollar would not be necessary. We do not consider the stock a good purchase. It is essentially speculative, and looks more like a catch-penny scheme than a "safe and sane proposition."

CONSOLIDATED RAILWAYS IN OHIO AND INDIANA.

One of the most important recent developments in connection with the interurban electric railways of the middle west is the consolidation of a large number of properties (aggregating 1,639 miles) in Ohio and Indiana controlled by interests allied with the United Gas Improvement Company, of Philadelphia, and perhaps most generally described as the Morgan-Dolan-Schoepf-McGowan syndicate. The gentlemen most prominently representing these interests are Randal Morgan, vice-president United Gas Improvement Company, Philadelphia; Thomas Dolan, president United Gas Improvement Company, Philadelphia; W. Kesley Schoepf, president Cincinnati Traction Company and president Indiana Columbus & Eastern Traction Company; Hugh J. McGowan, president Indianapolis Traction & Terminal Company; A. W. Brady, president Indiana Union Traction Company; and James Murdock, president Merchants' National Bank, Lafayette, Ind.



Map of Indiana Columbus & Eastern Traction Company's Lines and Properties Owned by Associated Interests.

Ohio Properties.

The interurban lines in Ohio which are included by the Indiana Columbus & Eastern Company are:

	Miles.
Columbus Newark & Zanesville, extending from the city of Columbus, through Newark to Zanesville, including approximately 30 miles of city lines in Newark and Zanesville, also the lighting company in Zanesville (operated under lease)	96.48
Columbus London & Springfield, from Columbus to Springfield, including a standard gauge interurban loop in the heart of the business section of Columbus	57.43
Columbus Grove City & Southwestern, from Columbus to Morgans	16.70
Dayton Springfield & Urbana, from Springfield to Dayton, with branch to Urbana, including 25 miles of double track to be constructed between Dayton and Springfield	78.83
Urbana Bellefontaine & Northern, from Urbana to Bellefontaine	21.46
Springfield & Western, from Medway to New Carlisle	4.89
Dayton & Northern, from Dayton to Greenville	42.50
That portion of the Dayton & Muncie from Greenville to the Ohio and Indiana state line at Union City	12.00
Dayton & Western, from Dayton O., to Richmond, Ind. (operated under lease)	42.50
Extension from Bellefontaine to Lima	32.00
Electrification of existing steam line (formerly Columbus & Lake Michigan) from Lima to Defiance	40.00
Total	444.79

Of these 445 miles, 348 are in operation and 97 building; the portion owned is 305.81 and the rest, 138.98 miles, is operated under leases that are practically perpetual.

Estimates for the first full year of operation by the company are given by Sanderson & Porter as follows:

Gross earnings	$2,050,000
Operating expenses	1,171,000
Rental charges (as reported)	302,205
Interest charges	576,795
Surplus above all charges	181,795

The Indiana Columbus & Eastern connects with the following lines which are controlled by the same interests:

Lima & Toledo Traction Company, now practically completed from Lima to Leipsic, O., a distance of 25 miles. The additional 35 miles from Leipsic to Toledo is to be built next spring. The Lima & Toledo has leased the road of the Ft. Wayne Van Wert & Lima Traction Company, operating from Lima to Ft. Wayne, a distance of 64 miles, and also that of the Lima Electric Railway & Light Company, operating the local railway line and electric lighting plant of Lima. At Ft. Wayne connection is made with the Ft. Wayne & Wabash Valley Traction system.

Cincinnati Northern Traction Company, operating from Dayton to Cincinnati, a distance of 55 miles, with a branch line to Germantown, 5 miles, and 13 miles of local lines in Hamilton. The Cincinnati Northern is building a second track from Dayton to Miamisburg, a distance of 11 miles; this will be on a private right of way. Some second track will be laid near Hamilton.

Indianapolis & Eastern Railway Company at Richmond, Ind.

Indiana Union Traction Company at Union City (which is on the state line).

The officers of the Indiana Columbus & Eastern are:

President, W. Kesley Schoepf, who is president of the Cincinnati Traction, the Cincinnati Northern Traction, and the Lima & Toledo Traction companies.

Secretary and treasurer, F. A. Deverall, who fills the same offices for the Lima & Toledo.

Vice-president, J. B. Foraker, Jr.

Vice-president, N. McD. Crawford, in charge of operation.

Vice-president, D. G. Edwards, in charge of freight and passenger traffic.

The property of the consolidated company is divided into three sections, each in charge of a general manager, which are:

Lines east of Columbus, W. A. Gibbs, Newark, O.

Lines west of Columbus and south of Lima, J. L. Adams, Dayton, O.

Lines north and west of Lima, F. T. Hepburn, Lima, O.

Indiana Properties.

Plans for a similar consolidation of the allied Indiana properties have not been announced, and the Indiana lines are grouped as follows:

Ft. Wayne & Wabash Valley Traction Company, operating from Ft. Wayne to Bluffton and from Ft. Wayne to Logansport, and the local lines in Lafayette, and building between Lafayette and Logansport; miles operated, 172.

Indiana Union Traction Company, operating between Indianapolis, Logansport, Peru, Wabash, Bluffton and Union City; miles operated, 319.

The so-called merger lines entering Indianapolis and not included in the two foregoing which have separate operating organizations. Of these merger lines each retains its old organization, but for operating purposes all are under the jurisdiction of one general manager, C. C. Reynolds, with headquarters at Indianapolis. These lines comprise:

Indianapolis & Northwestern Traction Company	93 miles
Indianapolis & Western Railway Company	12 miles
Indianapolis Coal Traction Company	14 miles
Indianapolis & Martinsville Rapid Transit Company	30 miles
Indianapolis & Eastern Railway Company	91 miles

Indianapolis Traction & Terminal Company, operating the street railways of Indianapolis.

Additional Power Equipment.

There are now under construction and under contract considerable additions to the power generating equipment of the properties.

A generating station for the Ft. Wayne & Wabash Valley Traction Company, which is practically completed, is illustrated in this issue of the Electric Railway Review.

There is now under construction at Hamilton, O., a generating station that in general design is very similar to the new station of the Ft. Wayne & Wabash Valley Traction Company. The equipment will comprise three 1,500 kilowatt and one 750-kilowatt Westinghouse turbo-alternators, generating at 375 volts, three-phase, the current being stepped up to 33,000 volts for long distance transmission.

At Lima, O., there will be installed two 400-horsepower Babcock & Wilcox boilers and one 375-kilowatt, 600-volt Westinghouse generator, direct connected to a Buckeye engine, this unit being removed from the power plant at Hartwell.

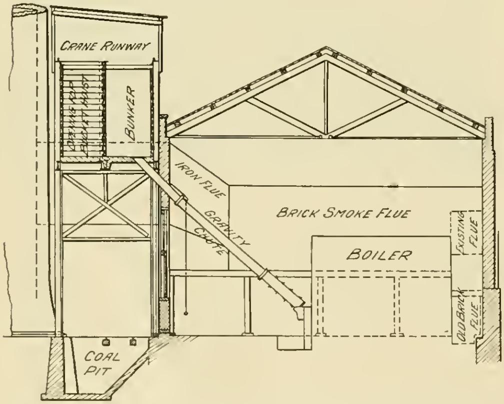
At Hebron, O., two 400-horsepower Babcock & Wilcox boilers will be added to the power station equipment.

At Medway, O., two 1,500-kilowatt and one 750-kilowatt Westinghouse-Parsons turbo-generators (375 volts three-phase) and two 525-horsepower Babcock & Wilcox boilers for 150 pounds pressure and 75 degrees superheat will be installed.

At Indianapolis, Ind., two 1,500-kilowatt Westinghouse turbo-alternators and three 400-horsepower Babcock & Wilcox boilers without superheaters will be added.

COAL-HANDLING PLANT, DEPOT STREET STATION OF THE CINCINNATI TRACTION COMPANY.

An interesting coal-handling plant has been installed at the Depot street station of the Cincinnati Traction Company, the arrangement of which is shown in the accompanying drawing. Alongside the station and extending its entire length, 223 feet, there was erected a structure 16 feet 7 inches wide between the centers of the supporting columns and about 60 feet high. This is placed over several pits 10 feet deep, over which a railroad track is laid lengthwise at the grade level. Coal is dumped from cars into this pit. The bunker is at an elevation of 29 feet above the boiler-room floor and is 16 feet high by 16 feet wide. Above the bunker is space for the operation of a Jeffrey traveling crane which has a span of 16 feet 3½ inches and is equipped with three Westinghouse crane motors, of the street railway type, of 60, 10 and 5 horsepower, respectively. The crane bucket has a capacity of a cubic yard. At four points lengthwise of the bunker structure there are rectangular pockets 7 feet 11½ inches by 11 feet 5¼ inches in the outer wall of the bunker, which permit the crane hoist to descend to the dumping pit and through which coal is elevated to above the bunkers and thence distributed as desired. This permits the railroad track to be used for storage purposes, there being room for several loaded cars at one time, and the spacing of the pockets in the side of the bunker permits any or all of them to be unloaded at a point accessible to the crane hoist with very little shifting of the cars and also the coal to be elevated may be readily distributed to any point along the bunker.



Depot Street Station, Cincinnati Traction Company—Cross Section of Coal-Handling Plant.

The floor and walls of the dumping pit and the floor of the bunker are of concrete. The frame of the structure is steel and the bunker sides are of concrete.

SPY RUN GENERATING STATION OF THE FORT WAYNE & WABASH VALLEY TRACTION COMPANY, FORT WAYNE, IND.

The Fort Wayne & Wabash Valley Traction Company is now completing its high-tension generating station, which is located on Spy Run avenue, about 1½ miles distant from the center of the city. The station building proper is 50 feet 6 inches by 180 feet in ground dimensions and adjoining it is a coal storage basin extending the full length of the building, 60 feet wide by 14 feet deep below grade. This basin is 12 feet 6 inches from the station building, the intervening space being utilized for a coal bunker, with bottom, walls and roof of reinforced concrete, which is supported at a height of 24 feet above the boiler-room floor and from which the coal may be delivered through chutes to the furnaces.

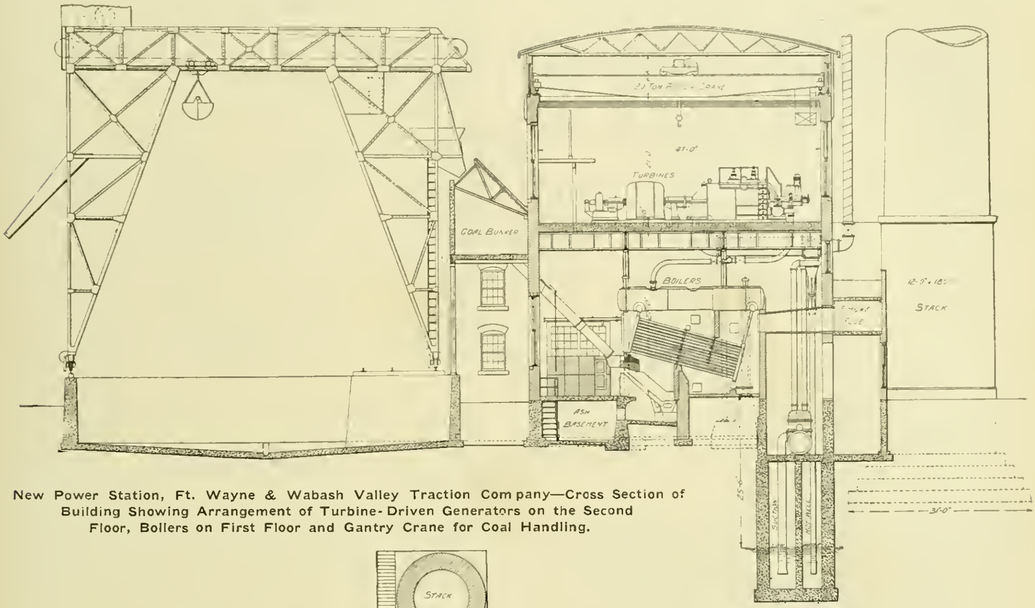
New Power Station, Ft. Wayne & Wabash Valley Traction Company—General View Showing Stage of Construction September 26.

This station is of unusual design in the placing of the generator equipment on a second floor above the boiler room, an arrangement which is practicable because the turbine units do not require massive foundations. There have been various power plants constructed with the apparatus installed on two or more floors, but more generally it is the boiler equipment which is thus placed in tiers. One of the Chicago stations (Union loop power house) has the boilers located in the upper story with reciprocating engines on the floor below. The arrangement of the Fort Wayne & Wabash Valley plant is an admirable example of the division of the equipment into units, occupying successive sections of the building. Reference to the drawings will show the general arrangement of the machinery in the station.

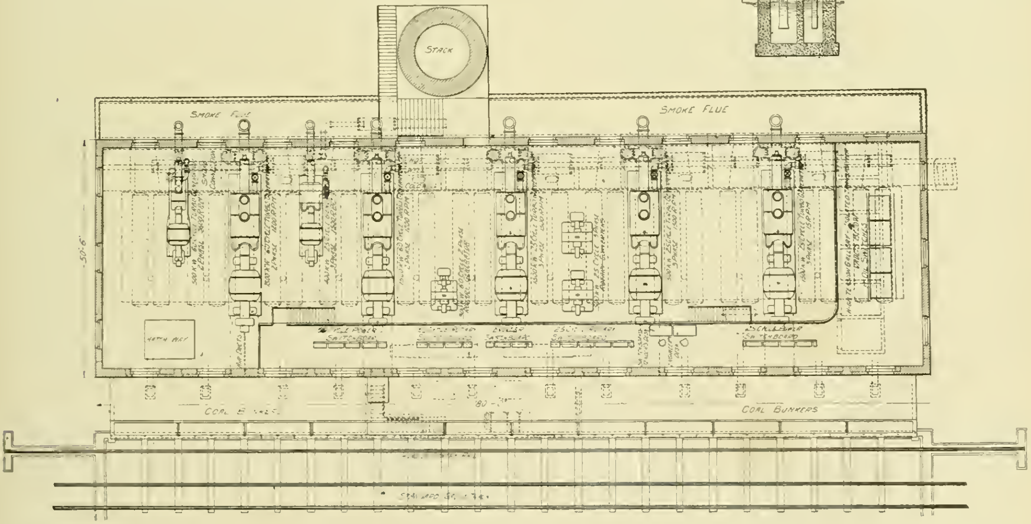
The building is of pressed brick of pink color, with roof of cinder concrete, reinforced with Kahn bars, supported on steel trusses. The interior of the generator-room, which occupies the second story of the building, is faced with white enameled brick up to the craneway. The floor of the generating room is of cinder concrete reinforced with expanded metal. The only opening in this floor is a hatchway 8 by 11 feet in size, provided for convenience in installing machinery. Normally this hatchway is closed and the only communication, without going outside the building, between the generating room and the boiler room, which is on the ground floor, is through a stairway built in the coal bunker section of the building.

Low water level in the Maumee river, from which the circulating water for the condensers is taken, is 25 feet 6 inches below the level of the boiler-room floor, and along one side of the building at the rear of the boiler foundations there have been constructed conduits for condensing water. These extend the entire length of the building, one conduit receiving the suction pipes for the condenser circulating pumps and the other receiving the condenser discharge.

The stack, which is at one side of the building, is of the Custodis construction, 12 feet in diameter and about 180 feet high; the base is of the same pink pressed brick as used for the building, and the upper portion of white brick. The smoke flue is built of brick and is placed outside of the boiler room with sheet-iron connections from the boiler settings. The flue is 8x7 feet 6 inches in section at the center and tapers each way toward the end boilers. One side of the flue is a brick wall parallel with the outside wall of the building which two walls with the reinforced concrete top and bottom, form the flue.



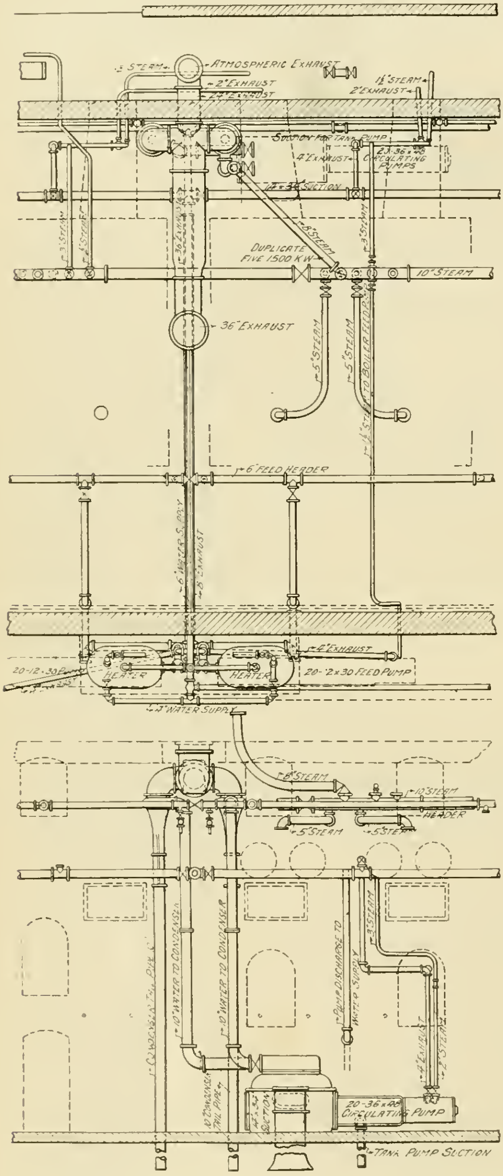
New Power Station, Ft. Wayne & Wabash Valley Traction Company—Cross Section of Building Showing Arrangement of Turbine-Driven Generators on the Second Floor, Bollers on First Floor and Gantry Crane for Coal Handling.



New Power Station, Ft. Wayne & Wabash Valley Traction Company—General Plan Showing Arrangement of Turbine Units.

The damper for regulating the draft is a 1¼-inch steel plate bent to a radius slightly less than that of the interior wall of the stack and supported from a vertical shaft at the center of the stack so as to swing concentric with the stack wall and close to it. The flue opening is 7 feet 9 inches wide by 16 feet high arched at the top, and the damper plate is 8 feet 3 inches wide (length of the chord) and 16 feet 3 inches high. To hold the damper in shape four straight bars ½x3 inches and 6 feet long are placed across the concave side 4 feet 3 inches apart, and riveted at the ends. The shaft carrying the damper is 2¼ inches in diameter set in a step bearing at the bottom and with the top bearing braced by three ⅝x3-inch bars reaching to the stack walls.

The boiler equipment comprises ten 400-horsepower Babcock & Wilcox boilers, with forged steel headers, designed to give 75 degrees of superheat, the working pressure being 175 pounds per square inch. The boilers are to be equipped with Roney stokers. Each boiler has a 5-inch steam connection to the main header which is 10 inches in diameter. Branches are taken off from the main header at extra heavy cast-steel manifolds. The steam connections to the 1,500-kilowatt units are 8 inches in diameter and those to the 500-kilowatt units are 5 inches in diameter. All the high-pressure piping is designed with standard dimensions for carrying 250 pounds pressure and the low-pressure piping is designed to 125-pound standards.



New Power Station, Fort Wayne & Wabash Valley Traction Company—Plan and Elevation of Piping Connections for One 1,500-Kilowatt Unit and Condenser.

The coal storage plant is served by a Gantry traveling crane with a one-ton Kester bucket, and was furnished by Fairbanks, Morse & Company of Chicago. Coal is dumped into a McCaslin single-roll crusher, motor-driven. The concrete basin, in which the coal is piled, is 60 by 180 feet and 14 feet deep and has a capacity estimated at 7,000 tons. The capacity of the coal bunker proper is about 600 tons. The plant has a rated capacity for handling 40 tons per hour out of cars or out of storage into the bunkers. The traveling speed of the crane is 50 feet per minute and the hoisting speed of the bucket is 250 feet per minute.

The generating equipment comprises: Two 1,500-kilowatt, 25-cycle, three-phase Westinghouse-Parsons turbo-generators, designed for 375 volts at 1,500 revolutions per minute. One 400-kilowatt turbo-generator, of the same speed, voltage and frequency. Two 1,500-kilowatt, 60-cycle, two-phase Westinghouse-Parsons turbo-generators, designed for 2,300 volts at 1,200 revolutions per minute. One 500-kilowatt, 60-cycle, two-phase Westinghouse-Parsons turbo generator, designed for 2,300 volts at 3,600 revolutions per minute.

For current transformation there are three 500-kilowatt, 25-cycle, three-phase rotaries for railway work, and one 300-kilowatt, 60-cycle, two-phase rotary for commercial power. The transmitting potential for long distance is to be 33,000 volts and there are provided six 375-kilowatt step-up transformers for raising the generating potential of 375 volts to 33,000 volts, three-phase, to supply four three-phase transmission circuits, two circuits being taken from each set of transformers. The transformers will stand in separate brick vaults on the level of the engine-room floor, each vault having a 12-inch cinder-concrete roof and fire doors. The vaults will be piped for draining oil from the transformer to a storage tank in the pump room on the first floor.

The cables from the generators to the switchboards and also between the various sections of the main switchboard will be carried in bituminized fiber ducts buried in the floor.

An exciter of capacity for two units is direct-connected to each turbine.

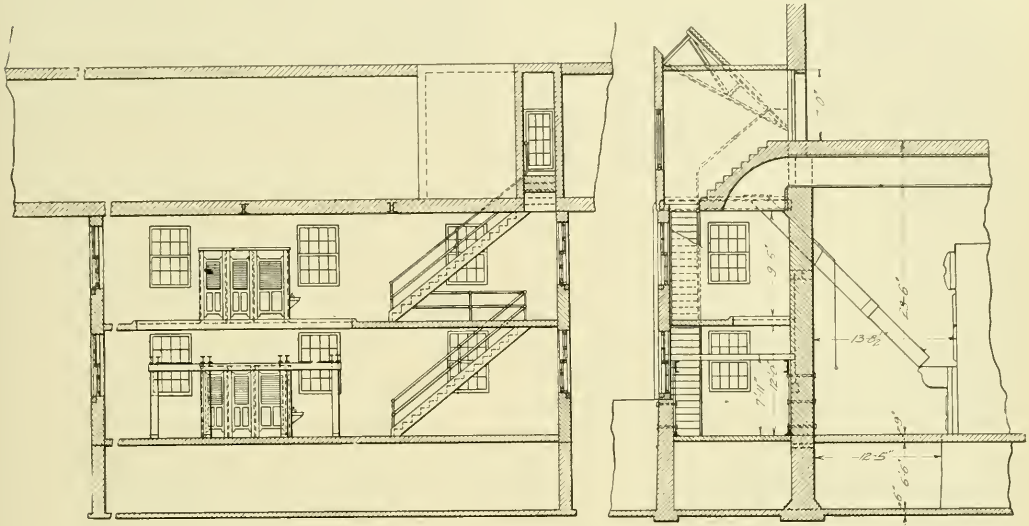
The engine room is served by a 20-ton crane of 47-feet span, built by the Niles Tool Works, and equipped with three 500-volt Crocker-Wheeler motors.

A system of air ducts is provided to supply air for the cooling of the generators of the turbine units. A header approximately 9x4 feet in cross-section is carried the length of the building just under the floor separating the generator and boiler rooms. This duct is of No. 6 gauge black iron and has branches 2x6 feet in section leading to each generator. At the generator the branch duct is sub-divided, each branch having an opening about 21 inches by 6 feet. The discharge of air from the generator casings is into the boiler room, the discharge being controlled by dampers regulated from the generator room above. The details of the air duct for one of the 1,500-kilowatt, 25-cycle units is shown in one of the illustrations.

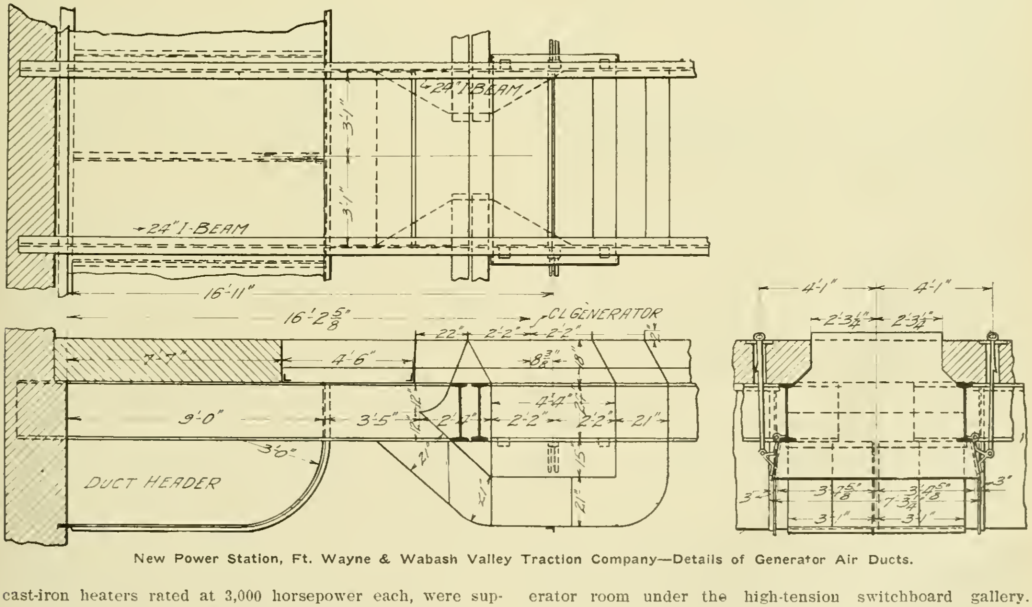
The condensers are located along the side of the building back of the boilers and comprise one twin 24-inch Buckley syphon condenser for each 1,500-kilowatt unit; one 18-inch single condenser of the same make for the 500-kilowatt machine and one 16-inch single condenser for the 400-kilowatt generator. These are designed to maintain a 28-inch vacuum.

The circulating pumps are the Yough piston type made by Boyts, Porter & Co., of Connellsville, Pa. Those for the 1,500-kilowatt condensers have steam cylinders 20x48 inches and water cylinders 36x48 inches, and operate at from 15 to 20 strokes per minute. The pistons on the water ends of these pumps are of wood about 30 inches long and 36 inches in diameter, with wagon wheel felloes for packing rings. The valves are 10 inches in diameter, of soft, gray rubber. The circulating pumps for the smaller condensers are of the same type and make, but of smaller dimensions, each being 12 and 20 by 48 inches.

The feed pumps are of the Yough type, 20 and 12 by 30 inches, outside end-packed plungers and brass valves. Two Yough tank pumps, 10 and 12 by 18 inches, deliver from the hot-well to a 25,000-gallon steel tank, located near the end of the building and supported on steel columns at a height of about 52 feet above the boiler room floor. Two open cast-iron heaters rated at 3,000 horsepower each, were supplied by the Platt Iron Works of Dayton, O.



New Power Station, Ft. Wayne & Wabash Valley Traction Company—Details of Lavatories.



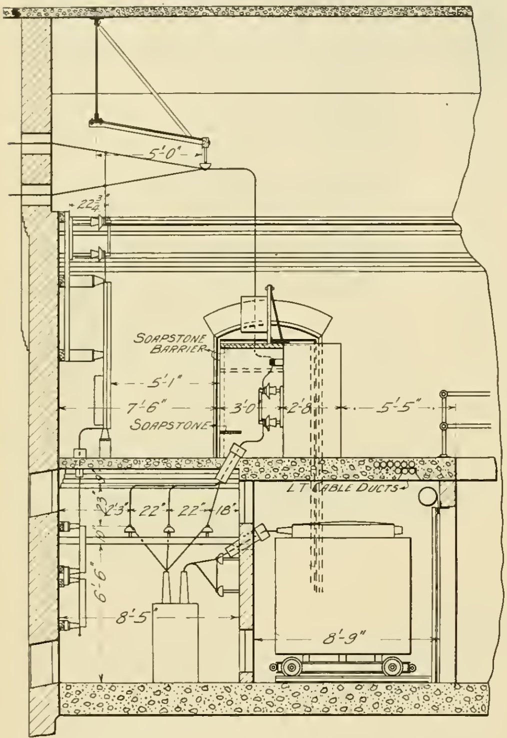
New Power Station, Ft. Wayne & Wabash Valley Traction Company—Details of Generator Air Ducts.

The boiler feed pumps and heaters are located in the fireman's lavatory, which occupies a space about 45 feet long under the coal bunker near the center of the building. This room is 12 feet high and above it is a room of the same dimensions 9 feet 7 inches high, which is the lavatory for the generating room force. The stairway through these rooms furnishes the only means of ordinary passage between the boiler and generating rooms, unless one goes outside the building. The main entrance of the station is near the stack and is over the smoke flue.

The transformers are located at the end of the generator room under the high-tension switchboard gallery. The switchboards for controlling the various rotaries are located in the gallery along the side of the generator room, as indicated in the plan. These boards are made up of standard Westinghouse panels. The exciter switchboard consists of three panels, one being a Tirrell regulator panel with three regulators, one for 25-cycle current, one for 60-cycle current and a third for a spare; and two panels, each controlling two exciters.

The 25-cycle switchboards comprise 14 panels as follows:

2 panels for 1,500-kilowatt generators.
1 panel for 400-kilowatt generators.
2 panels for low-tension sides of the transformers.
3 panels for the alternating-current ends of rotaries.
3 panels for the direct-current ends of the rotaries.
2 panels, each of which controls two 800-ampere direct-current feeders.
1 panel, with one 800-ampere direct-current feeder.



New Power Station, Ft. Wayne & Wabash Valley Traction Company—Arrangement of High-Tension Apparatus.

The 60-cycle switchboards comprise panels as follows:

2 panels for 1,500-kilowatt generators.
1 panel for 500-kilowatt generators.
1 panel for 300-kilowatt motor feeder.
2 panels, each for two 300-kilowatt single-phase feeders.
2 panels, each for two 150-kilowatt single-phase feeders.
1 panel for controlling the alternating-current end of 300-kilowatt rotary.
1 panel for controlling the direct-current end of 300-kilowatt rotary and in addition carrying 500-ampere feeder.

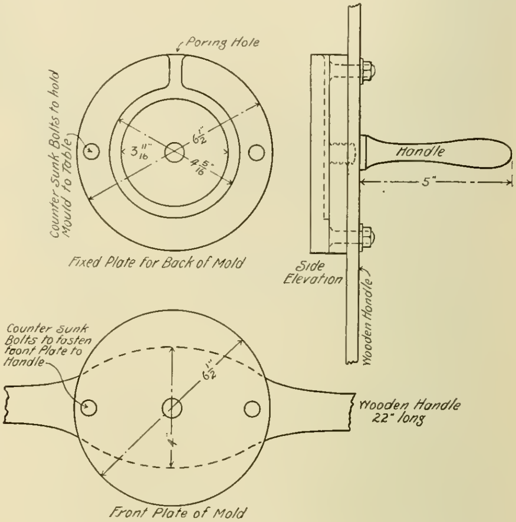
As designed, the station provides for four alternating current feeder lines, one of which will not be installed at this time.

This station was designed in the office of the Cincinnati Traction Company, Dr. Louis Duncan being retained as consulting engineer.

The car storage house of the Boston & Northern Street Railway Company at Chelsea, Mass., was destroyed by fire on the night of September 27. The building, together with about 80 valuable cars and other equipment, was a total loss, the loss being estimated at about $300,000, the greater part of it representing the rolling stock. The fire is believed to have been of incendiary origin.

LEAD GASKETS FOR WATER-TUBE BOILERS.

Mr. R. W. Parry, chief engineer of the power house of the Scioto Valley Traction Company, has for some time been using lead instead of asbestos for gaskets for the hand holes of the Franklin water-tube boilers, with which this station is equipped. The lead gasket is reported to be more satisfactory in service than the asbestos and to require far less time for replacement. The gaskets required for use in the station are of two sizes. The smaller is 4 5/16 inches outside, with an inside diameter of 3 11/16 inches. The lead rings are cast about 5/32 inch thick. The work of casting the gaskets is done at odd times. Two molds, one for each size, are attached to a bench in the boiler room. The accompanying sketch shows the dimensions of the plates forming the smaller mold. These are cast iron discs, one of which is grooved and is secured to the front of the bench with a half-inch screw projecting at the center. The other plate, which has a smooth surface, is screwed up against the grooved disc, forming a tight mold.


Poring Hole
Counter Sunk Bolts to hold Mould to Table
3 11/16"
6 1/2"
4 5/16"
Fixed Plate for Back of Mold
Side Elevation
Handle
5"
Wooden Handle
Counter Sunk Bolts to fasten front Plate to Handle
6 1/2"
Wooden Handle 22" long
Front Plate of Mold

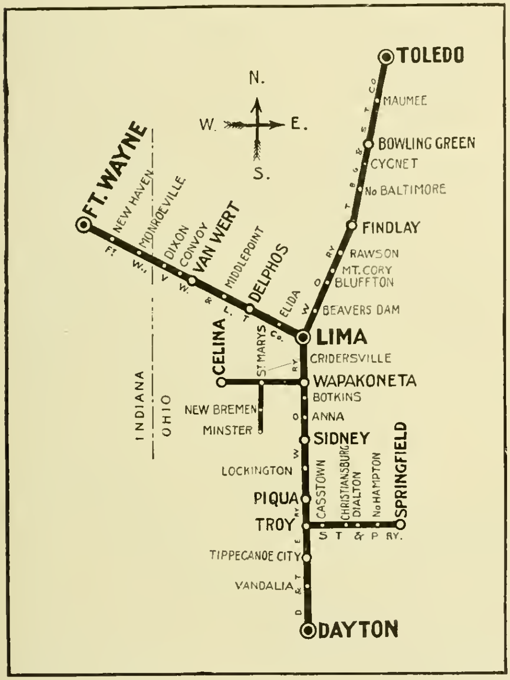
Mold for Casting Lead Gaskets—Sketch Showing Details of Mold.

Use of Metal Ties in Germany.

Those who contemplate the substitution of metal railroad ties for wood will do well to study the experience of the German railroads, which has been not only extensive but long. As early as 1868 a report on metal ties was made to the technical convention of the German Railroad Union, and in 1889 no less than 9,902 miles of railroad in Germany had iron or steel ties. In this early period it was hoped to make practically a continuous rail by substituting longitudinal metal sleepers for cross-ties; and at this date 6,181 miles of the total 9,902 had such sleepers. But these lost favor, and by 1900, while the track laid with iron cross-ties had increased to 10,695 miles, the longitudinal sleepers had largely disappeared. In 1903 more than one-fourth of the through tracks in Germany had steel cross-ties, namely, 11,534 miles, against 32,192 on timber ties. The increase since 1889 seems inconsiderable, and there certainly is no such tendency as formerly to abandon wood for iron; but on the other hand the metal ties are not condemned, as is clearly shown by the fact that from 1900 to 1903 the additions to track on steel ties amounted to 1,349 miles, against 3,549 miles on wood.—The Railway Gazette.

METHODS OF HANDLING FREIGHT ON THE DAYTON & TROY ELECTRIC RAILWAY.

The experience of the Dayton & Troy Electric Railway in handling freight is of special interest, in that this company, which operates a 31-mile interurban electric line running from Dayton, O., north to Piqua, was the first company operating out of Dayton to undertake the transportation of freight at competing rates under the standard classification. When the company first undertook to care for freight traffic it adopted a flat tariff, which was about the equivalent of the first-class rates of the standard classification, and operated for several months without any agents other than the motormen and conductors, who, in addition to operating their cars, received and delivered package freight and occasionally acted as agents in making collections. At this time the freight cars of the company operated only to the city limits of Dayton and considerable dissatisfaction was experienced because of the delay in delivery of packages at this point. Later a contract was made with an express company in Dayton to operate over the Dayton & Troy lines doing an express and freight business. Operation under this contract was continued for about a year, the express company paying to the railway company 45 per cent of the gross receipts in addition to paying for the time of the car crews. The railway company found that this was not profitable for it and accordingly determined to engage in the freight business on its own account. The new plan was put into effect about a year ago, the freight station at Dayton being opened in November, 1905.



Dayton & Troy Freight Handling—Diagrammatic Map of Through Routes.

The company's tariff is based upon the rates of the steam railroads which can handle freight between the points served, the railroads' official classification being followed. The Dayton & Troy company found it necessary to make its rates lower than that of competing steam lines in a few instances. For instance, from Dayton to North Baltimore the rate by steam railroad was 25 cents per hundred, first class, while to Galatea by another steam line the rate was 28½ cents. Inasmuch as Galatea lies between North Baltimore and Dayton, the Dayton & Troy company had to make its rate for Galatea and points between that and North Baltimore 25 cents, in order to meet the requirements of the law that the charge for a given haul should not be greater than for a longer haul over the same rails in the same direction.

The Dayton & Troy company furnishes to shippers patronizing it copies of the official classification, in the form of a book, 150 pages, 5 by 7¼ inches.

The company maintains agents at Dayton, Tippecanoe City, Troy and Piqua, and other stations will be provided with freight agents as rapidly as the business develops. Until the necessary business is in sight to justify this, stations, other than the four mentioned, will be maintained as prepaid stations.

For convenience in conducting the business, especially as regards advertising, routing shipments on way-bills and correspondence, the electric lines connecting Dayton, Fort Wayne and Toledo have been grouped under the term "Lima Route." Reference to the diagrammatic map shows the extent of the Lima route. It comprises between Dayton and Toledo the Dayton & Troy, the Western Ohio and the Toledo Urban & Interurban companies, and between Dayton and Fort Wayne the Dayton & Troy, the Western Ohio and the Fort Wayne Van Wert & Lima companies.

The revenue per car-mile derived from the freight service is greater than the revenue per car-mile in passenger service. About 250 freight car-miles and 2,000 passenger car-miles are made per day. The ratio of operating expenses to gross receipts for the freight service is .45, the operating expenses including the pay of freight agents and the trainmen engaged in the freight service and cost of power.

In the matter of forms and methods the practice of freight departments of steam railroads has been exactly followed, so far as was possible. Perhaps the best idea of the methods of the company can be had from a description of the various blanks used.

1. Bill of Lading.—This is the standard form of the Trunk Line Freight Association, 8½ by 11 inches, printed on yellow paper, with a second sheet on white paper and a third sheet on pink paper. The original (yellow sheet) is known as the "Bill of Lading" and is the consignor's receipt for goods delivered to the company. The second sheet (white paper) differs from the original only in the substitution of the "Shipping Order" for "Bill of Lading" and is the shipping order signed by the shipper and retained by the agent. The third sheet (pink) is a memorandum to be sent to the consignee by the shipper. On the back of each of these three forms there is to be found the usual lot of fine print, under the head of "Conditions."

2. Uniform General Release.—This form follows that of the Trunk Line Freight Association and is printed on a sheet 8 by 10½ inches. This contract of general release from liability is required in all cases where a release is required by official tariffs for a shipment to local stations and is attached to the way-bill; for shipments over connecting railways it is executed in duplicate, the original being attached to the way-bill and the duplicate forwarded to the auditor of freight receipts.

3. Uniform Limited Liability Livestock Contract.—This is a more extended form and is printed on a sheet 8½ by 14 inches. This contract describes the goods and enumerates the maximum liability for each class. A man accompanying the shipment signs a release of personal liability upon the back of this form.

4. Local Way-Bill.—For consignments requiring a few entries only this form is printed on a sheet 14 by 4¼ inches, rulings showing the consignor, consignee, the articles, weight,

rate, freight, advances made and charges prepaid. A longer form of the same kind is also provided. This form is filled out in copying ink, the agent taking a tissue copy for his book.

5. Interline Way-Bill.—This form is 14 by 8¼ inches printed on pink paper to distinguish it from the local way-bill form, and besides the information contained on the local way-bill has rulings to show the route, space being provided for six junction points and the corresponding connecting lines and at the bottom is a blank for the junction agents' record. This blank is filled out in copying ink and as many tissue copies are taken of it as there are connecting roads, plus one. The tissue copies of this form are sent to the auditor with the daily report of freight forwarded and the auditor forwards a tissue copy to each of the roads concerned.

6. Expense Bill.—This is a freight bill and is made in duplicate; it is perforated and folded for making a carbon copy for the duplicate. Each half of the form is 8½ by 5½ inches.

7. Freight Forwarding Abstract.

8. Freight Received Abstract.

9. Daily Station Balance.

The purpose of forms 7 and 8, which are 8½ by 11 inches, is indicated by their names and each shows the numbers of way-bills, destination, route, weight, freight, advances and amount prepaid. No. 9, which is 8½ by 8¼ inches, is ruled for a statement of amounts received and remitted. All three of these are made daily, being filled out in copying ink, the agent taking a tissue copy for his own records and forwarding original to the auditor with the tissue copies of interline bills and way-bills. For forwarding these to the auditor addressed envelopes, 5x11½ inches, are provided.

10. Correction Blank.—This is a sheet 8½ by 10 inches and is the skeleton of a letter of instructions from the freight auditor to the agent.

11. Way-Bill Corrections.—This is a form 8½ by 11 inches with two rulings, one of which is filled out to show the erroneous entry and the other to show the entry as it should be.

12. Tracer.—This is a blank 8½ by 11 inches, containing a description of the way-bill reference and such detail or explanation as the case demands. Instructions for using the tracer require that agents when requested to trace any shipment shall fill one of the tracer forms and mail at once to the general office with all papers. Copying ink is used for the original, the agent taking a carbon copy. When tracers are received by an agent he notes the station name and record he has of the shipment, forwarding the tracer at once to the next station.

13. Notice for Consignee.—This is a postal card on the back of which is printed a skeleton letter to be filled out by the agent showing location of the shipment and amount of charges.

14. Routing Orders.—Three forms of routing orders are used where they will do the most good, being furnished to shippers to send to the concerns of which they buy. They are on cards about 6 by 4 inches. One form reads, "Unless otherwise ordered, kindly consign all freight shipments for the undersigned via ——— and connections." The second form specifies the Lima route and a third one the Dayton Troy & Electric Railway.

15. Over Report.—This form is 8½ by 11 inches, printed on red paper with rulings to show the original destination, shipper and consignee for articles which are over, the articles billed and the articles over with details as to marking, probable value of the articles over, and the disposition, if any, which was made. An over report is made out for each lot of articles over at any station, even if disposition of them is made immediately. These reports are numbered consecutively and made out in copying ink, the agent taking a carbon copy. The original is mailed to the auditor, who takes a tissue copy.

16. Adjustment for Over Report.—This is a skeleton letter on a pink sheet 8½ by 5½ inches, intended as a statement as to the adjustment made for the over report of a given number.

17. Short Report.—This form is 8½ by 11 inches, with rulings similar to No. 15, excepting that the word "short" is substituted for "over."

18. Adjustment for Short Report.—This form is the same size as No. 16 and is printed on green paper.

19. Damage Report.—This form is 8½ by 11 inches, is similar to Nos. 15 and 17 and is printed on blue paper. A damage report is required in every case where freight is injured, no matter how slight the injury.

20. Damage Adjustment.—This form is similar to Nos. 16 and 18, but printed on blue paper to conform to No. 19.

21. Memorandum Way-Bill.—This form is 4 by 8½ inches ruled to show the name of the station from which it was issued, the consignee and destination and a list of the articles shipped, with their weight. It is used when an agent has not time to make out a way-bill in the usual form and is given to the conductor to furnish him with a record of the goods transported.

22. Shipping Tags.—Shipping tags are 5 by 2½ inches and bear the words "Via the Dayton & Troy Electric Railway." They are furnished to shippers as an accommodation and as an advertisement of the company's freight service.

23. Round-Trip Bread Ticket.

24. Round-Trip Milk Ticket.

These two forms are printed on shipping tags 5 by 2½ inches with perforations two inches from the end. The end portion constitutes the coupon and is marked "Good for One Bread Basket" (or one 10-gallon milk can) as the case may be, between stations written in. This coupon is detached by the conductor who delivers the goods at destination. The other portion of the tag bears the name and address of the consignee and the name and address of the consignor, with the statement "Empty basket (or can) to be returned to ———." This is left on until detached by the conductor when delivering the basket or can to the original consignor.

25. Claim Backer.—This is an endorsement form 3 by 8 inches printed on one end of a manila sheet, 8½ by 12 inches, used as a wrapper for the papers relating to claims.

26. Apportionment Sheet.—This blank is printed on a sheet 24 by 19 inches and is kept by the auditor as a daily record of the apportionment of earnings among the Dayton & Troy and its connecting lines. It has rulings for 70 horizontal lines and column headings as follows: Date, Number, From, To, Weight, Freight, Advances, Prepaid, which refer to the way-bill reference, and 11 double columns in which the debits and credits for each of the transportation companies interested can be set out, the sheet thus being available for showing simultaneously the business with 10 other companies. The object of keeping this record is to have the information compiled daily and also to provide a memorandum for convenient reference.

27. Freight and Tonnage Record.—This is a blank 14 by 12 inches with column headings showing day, number, weight, total charges, advance charges, prepaid, collect and six blank columns. This is kept at the auditor's office, a separate blank being used for the traffic from each station to every other station. The pro rating is done on this blank, which should check with No. 26.

28. Daily Freight Traffic Report.—For the information of officials interested the auditor makes out a daily freight traffic report. This form is printed in copying ink on a blank 5½ by 8½ inches and shows the weight of freight handled and the revenue received, divided as to interline and local business, with the latter subdivided to show the four offices where freight agents are maintained.

29. Tariff.—The freight tariff published by the Dayton & Troy Electric Railway is a book of 20 pages, 8½ by 11 inches in size, which shows the rate for each of the six

classes between all points on that line and its connections, with a column showing the route index letter.

30. Divisions.—On this form are tabulated the division of receipts to be made on traffic between certain points. At the left hand are shown the stations between which this division is effective. At the right hand side are three columns showing first the lines over which the shipments are made, second, the number of miles which each road hauls, third, the per cent of the charges to be assigned to each road.

31. Station Record.—In addition to the forms described each station agent is provided with a book for listing those items which affect the station balance. This book has on the left-hand page column headings to show station from, date and way-bill number, car number, and initials, consignor or road delivering, consignee, pro. number, weight, freight advances, freight prepaid, date delivered, date paid, total uncollected. On the right-hand page are column headings showing station to, way-bill number and date, consignor, consignee, weight, freight advances, freight prepaid.

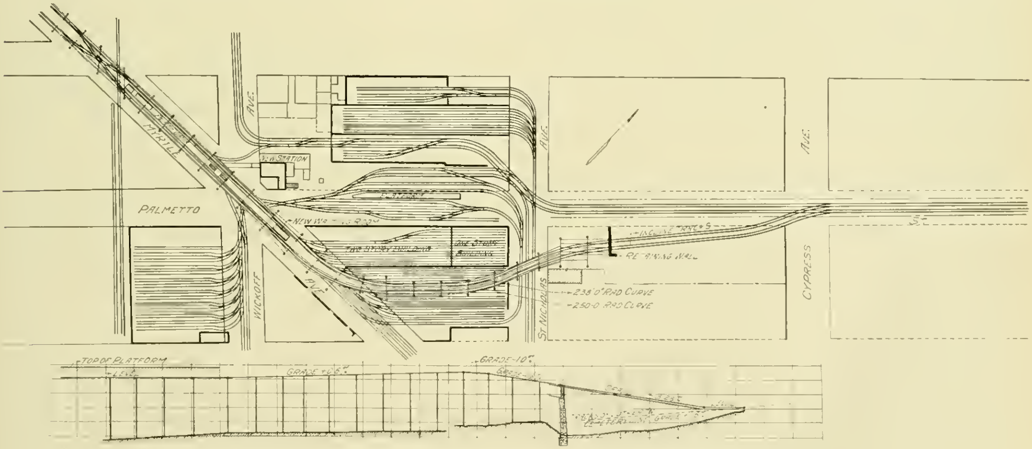
On January 1 last the Dayton & Troy Electric Railway Company occupied its new office building in Dayton which is located at No. 415 East First street, about four blocks distant from the Dayton passenger station and ticket office of the company. The lot occupied here has a frontage of 60 feet and a depth of 190 feet and is somewhat wider at the rear than in front. The office building occupies the front, consisting of a central portion 18 feet wide by 50 feet deep with 22-foot open on each side. The second story of this building is 40 feet deep and extends the full width of the lot, 60 feet. The passageway on the right of the entrance to the building is occupied by two railroad tracks which extend the entire length of the lot. That on the left affords an entrance for teams for reaching the freight houses and platforms in the rear. Back of the central portion of the office building is a freight platform 12 feet wide by 80 feet long extending back to the freight house, which is 45 by 60 feet. At the rear the freight house opens upon the tracks of the Big Four railroad, in front is accessible to wagons driving into the court, and on the side is open to two tracks of the Dayton & Troy company. The freight building has a 7-foot basement and is served by an elevator. It is lighted by arc lamps and gas. The office building is the headquarters for the general officers of the company.

The Norwich & Westerly Railway Company's line from Norwich, Conn., to the Rhode Island state line, was opened for traffic last month.

IMPROVEMENT OF THE BUSHWICK RAILROAD OF THE BROOKLYN RAPID TRANSIT COMPANY.

An interesting instance in which good returns on an investment for much needed improvements in facilities and service will be paid by the saving in operating cost incidental to the change, is shown in the case of the Lutheran Cemetery extension of the Brooklyn Rapid Transit Company, in Brooklyn, N. Y. For some years the Myrtle avenue elevated line of this company has ended with a stub terminal at Ridgewood station. Here transfers are given to the electric surface cars, operated over the old steam dummy road, known as the Bushwick Railroad, a line about 1½ miles long ending at the Old Lutheran and the New Lutheran cemeteries. While the local or feeder traffic on this line is inconsiderable, the fact that the road reaches these two large cemeteries and that its terminal is also within walking distance of Mount Olivet Cemetery, makes it one of the chief thoroughfares for the large number of persons who visit these grounds, particularly on Sundays. The line also connects with the Metropolitan avenue line, which runs to St. John's Cemetery, and which it is proposed to extend in the near future to Jamaica.

Brooklyn Rapid Transit Company—Showing Character of Construction on Bushwick Railroad.



Brooklyn Rapid Transit Company—General Layout of Tracks and Ridgewood Incline.

As the storage space for empty cars at the Ridgewood station has been very limited, it was found necessary to take the cars by a roundabout route of some 5½ miles to the East New York yards for inspection in the middle of the day and for storage at night. This made an expensive operating charge. The company solved this problem by the decision to rehabilitate the somewhat neglected old Bushwick line, build an incline from the elevated structure, establish surface storage yards and inspection pits and operate the elevated trains through, without stop, to the end of the Bushwick line. In pursuit of this plan, the company has relaid the Bushwick road with 80-pound rails and improved the roadbed to make it a standard, high-speed line. Over this road the cars will be operated by overhead trolley. Owing to the fact that the overhead wire is used on other surface extensions, many of the elevated cars of the company are equipped for operation by this means, and no expense of moment will be incurred on this score.

In making the junction between the elevated structure and the surface line it was found necessary on account of existing buildings to carry the incline structure in a circular detour, such as is not uncommonly seen on large elevated systems. The gradient is three per cent and the track is supported to a height of 10 feet on an earth fill held by a concrete retaining wall; thence the inclined structure is then carried on steel girders, one being an exceptionally heavy plate girder 4 feet 6 inches deep by 50 feet long. At a point where the Bushwick line crosses above the tracks of the Long Island the old bridge, a wooden structure, has been replaced by a double through plate girder bridge.

The storage yards, which will have space for 100 elevated cars, and a building for the accommodation of the yard master are located at Fresh Pond road. As the track shortly beyond this point curves from the east to northeast, the yards occupy the obtuse angle space in this bend. The yard is entered by a ladder serving nine tracks, with switching connection with the main line from the west. From the other direction two stub-end tracks have switching connection with the main line. A modern interlocking and signaling device has been installed by the Union Switch & Signal Company at these yards and over the entire line. At a point west of the ladder leading to the storage yard it is proposed to build a small shop with inspection pits for the accommodation of 36 cars.

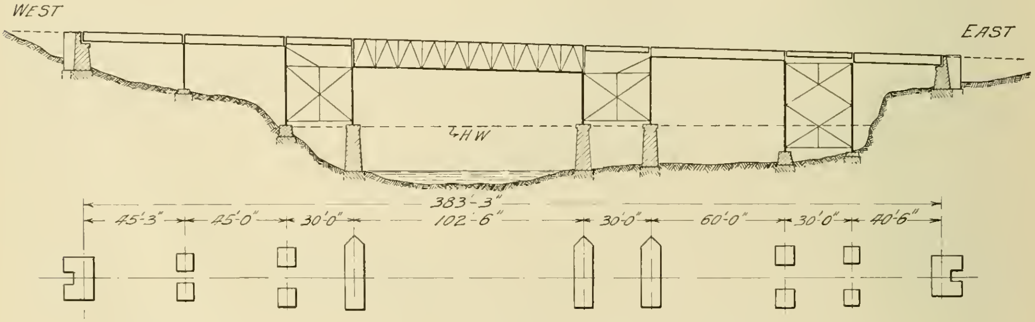
At the Lutheran Cemetery the line is being relocated with the purpose of shifting the terminal 100 feet west of the old terminal building, and a new brick station building will be built on the new site. This relocation has necessitated a heavy fill for a distance of 500 feet. This work, however, is being done at the expense of the Long Island Railroad under an arrangement by which the Brooklyn Rapid Transit Company agreed to move its terminal from the vicinity of the property of the New York Connecting Railroad. Besides the new terminal station, it is proposed to build three intermediate stations at Covert avenue, Forest avenue and Fresh Pond road.

The rehabilitation of this line is one of the many improvements recently studied out by the Brooklyn Rapid Transit Company in its policy of gradually bringing all parts of a once neglected rapid transit system up to a modern standard of excellence and at the same time of providing for the extensions called for by the unprecedented increase in traffic which the company has recently experienced on all branches of the great system.

BRIDGES AND VIADUCTS ON THE INDIANAPOLIS & CINCINNATI TRACTION COMPANY'S EXTENSIONS.

By courtesy of Mr. J. W. Moore, chief engineer of the Indianapolis & Cincinnati Traction Company, we are enabled to describe some interesting structures which have been built for the Connersville extension of the Rushville division and the Greensburg extension of the Shelbyville division of this company's line. At the crossing of Big William's creek on the Connersville line there was built a semi-circular arch with a 50-foot span and 35 feet above the surface of the stream and which is surmounted by an earth fill 30 feet high, the grade calling for 26 feet above the arch after shrinkage. The foundations for the abutments rest upon hard-pan found at a depth of about 6 feet and the abutments are 11½ feet thick. As there was some doubt whether a freshet might not carry away the false work before construction was complete the abutments and the first two sections of the arch on each side were reinforced with one-inch square Johnson cor-

Bridges and Viaducts, Indianapolis & Cincinnati Traction Company —50-Foot Concrete Arch to Support Grade 65 Feet Above Water Level.



Bridges and Viaducts, Indianapolis & Cincinnati Traction Company —Bridge Over Big Flat Rock River.

rugated bars in order that should the false work be disarranged by a flood this part of the construction would not be lost. The barrel of the arch is 97 feet 1 inch long with straight wings on the down-stream side 40 feet 1 inch long; on the up-stream side the wings are 46 feet 1½ inches long and flared 15 degrees. The parapet walls are 81 feet 10 inches long at the top and at the ends are reinforced. On each side two sections of the arch, each about 8 feet wide, are longitudinal, that is, extend lengthwise of the barrel. The top of the abutment is stepped, thus forming an anchor for the first longitudinal section. To key the second longitudinal section to the first two 3-inch by 12-inch planks were placed at the surface of the mold leaving corresponding depressions in the radial surface of the arched section. Similar grooves were provided in the radial surface of the second longitudinal section for keying purposes. The central portion of the arch was cast circumferentially in sections 15 feet wide.

This arch was designed in the offices of the company and was built by Whitney, Wilke & Stewart of Rushville.

The viaduct over the Big Flat Rock River at St. Paul on the Greensburg division has a total length of 383 feet 3 inches, the main span over the river being 102 feet 6 inches.

Near Shelbyville on the Greensburg extension the single track of the Indianapolis & Cincinnati is carried over a double track of the Big Four at an angle of 30 degrees between center lines. This requires an 80-foot through span which is of plate girder construction, with 24-foot squaring spans. On each side is a span of 50-foot deck girders for approaches. The piers are all concrete, the long ones for the through span being 8 by 23 feet at the bottom and taper to 6 feet wide at the top. The smaller piers of the squaring spans are 8 by 7 at the bottom and 6 feet wide at the top.

The loading for which these bridges were designed is continuous trains of 100-ton cars.

QUARTERLY MEETING, STREET RAILWAY ASSOCIATION OF THE STATE OF NEW YORK.

The quarterly meeting of the Street Railway Association of the State of New York was held at the Fort Orange Club, Albany, N. Y., on Wednesday, September 19, 1906, being called to order at 11:45 a. m. by the president, J. N. Shannahan, of Gloversville, who announced that the meeting was to consider the different systems of braking, this subject having been chosen at the request of Mr. Baker, of the New York State Board of Railroad Commissioners.

Mr. G. C. Graham, superintendent of car equipment, International Railway Company, Buffalo, presented a paper on "Brakes and Braking," and was followed by Mr. H. S. Williams, assistant electrical engineer, Utica & Mohawk Valley Railway Company, with a paper entitled "Different Systems of Brakes."

Mr. C. R. Barnes, engineer for the New York railroad commissioners, stated that the question of braking was taken up by the railroad commission, on account of the number of accidents occurring outside of the state, not in the state, and congratulated the managers present on the few accidents that had happened in New York from the failure of brakes and other causes. Some years ago the commission decided and had since held that safety of operation on heavy grades, on city and suburban lines, required a double chain brake, and nearly all the railroads of the state had their cars so equipped. Recently it had been found that several roads had discontinued the use of double chain brakes on account of defects which were developed by the idle chain. It had been found that there is not one accident in ten in which the motorman does not claim that he tried to control the car with his reverse, but was unable to do so. The commission was of the opinion that a single chain is not sufficient security for the proper control of cars in city service on heavy grades and the matter of brakes and braking had been brought to the attention of the association, in the hope that some practical improvement in the safety of operation might be brought out.

Mr. John A. Hanf, of Buffalo, stated that from an operating standpoint the airbrake is a valuable addition to equipment, but that from a mechanical standpoint it sometimes caused trouble. On interurban lines airbrakes were a necessity. The trouble was that airbrakes are misused by the motormen. With air it is no harder to throw on the emergency than to make a service stop. With a hand brake to apply the emergency requires manual power, and the emergency is not applied unless the motorman finds himself to be in a very tight pinch. Mr. Hanf stated his method of testing airbrakes was to take a car on a good rail, get it up to full speed, and then make an emergency stop; the wheels should then skid four or five feet, just before the car comes to a stop. If motormen or others meddled with the air apparatus trouble resulted. Sometimes it was found that a car set for air at 60 pounds would three, or four weeks later come into the shop set for 70 or 80 pounds. This was sure to cause trouble for the mechanical department and cost many dollars for flat wheels.

Mr. Hanf further said that his company had always had trouble with the double-chain brake; at first they worked well, but after they got dirty and clogged up they would not release properly. This is especially the case in the winter time. With only one chain there are better results. The eccentric-wind brake was considered the most satisfactory.

Replying to a question Mr. Graham (Buffalo) said he had never known of a broken brake chain, or of an accident which has occurred through a brake chain breaking. Referring to the use of the reverse to avoid accident the speaker said that a man will, with the circuit-breaker over his head, in making an emergency stop, naturally throw the controller on the fifth point. If he were operating a four-motor car and going at fair speed, and would pull the reverse lever and never mind the controller, the car would check itself, but if power were thrown on the circuit-breaker would open. With regard to chains, they are differently wound now. The chain does not take its support from a ⅝-inch bolt, but is wrapped on the drum, which gives better results.

Mr. E. F. Fassett, Albany, stated that all their cars had single chain brakes. At the time the United Traction Company took over the Troy road, the latter had double brake chains on the cars on the hills, and the master mechanic at that time had a great deal of trouble with them. After one winter of service, they were all removed on his recommendation. On hill cars an emergency brake, or a car holder, it might be more properly called, is used. This is used principally on the hills, where, in case of accident, if the car is going up the hill the emergency brake or car stop can be applied to prevent the car from dropping back down the hill. In case of breakage of any part of the operating mechanism of the car, in going down hill, the instruction to the motorman is to reverse his power and get the car moving as slowly as possible, and then drop the emergency brake for the purpose of holding the car. This has been done on numerous occasions when brake rods and other parts have given out. The proper use of the reverse is very well, but Mr. Fassett had had such bad experiences with the reversing of cars to prevent accidents, it was now his rule never to reverse the car at any time except when the braking apparatus is out of order. Tests showed that by reversing a car could not be stopped any quicker than with the usual application of the brake, and in most cases the circuit-breaker was opened and the car rendered helpless, and it was necessary to begin all over again with the hand brake.

Mr. Duncan McDonald, of Montreal, pointed out that on modern cars there is usually an airbrake and a hand brake, and with the possibility of the reversing of the car, the necessity for a second brake chain is considerably diminished. Even if the reversing of the motors with power on causes the blowing of the circuit fuse there is a further auxiliary, which is not so positive, but which works on about 90 per cent of the grades in Montreal. This consists in throwing the reverse on after the power circuit has been opened; it will still hold the car on the grade, almost as effectively as the airbrake or any other braking mechanism. The speaker felt confident in stating that for the last three years there had been no failure of brake chains on his road.

Mr. Barnes stated that the railroad commission was not advocating any particular brake apparatus but was seeking information.

Mr. T. W. Wilson, of Buffalo, stated that in his opinion the type of brake depended on the size of the car. A 21, a 23, or a 24-foot car did not need an airbrake; such a car could be controlled by the hand brake successfully, and have the auxiliary of the motors operating in opposition to each other, in case the brake gave out. With cars larger than, say, 27 feet, there should be some sort of power brake, and his experience had shown that the straight airbrake was the most successful. With electric brakes when coming to a stop on the hill, the brake releases until a certain speed is again attained. He did not consider the double chain a safeguard but rather the reverse, as in winter it was difficult to keep the chains in good order.

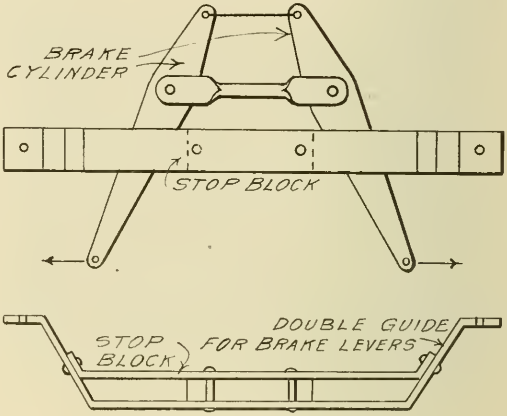
Mr. D. F. Carver, of Rochester, stated that in his experience the second chain had been of little value and caused considerable trouble, the conditions being very much worse in winter than in summer. As the Rochester cars are wired, it makes no difference whether the trolley pole is on or not, or whether the circuit-breaker is in or out, if the motorman properly handles his car he can bring it to a stop with one brake chain. His experience had been that the point of breakage is not nearly so likely to be in the chain as in the foot of the post, and that the double chain is not really the safeguard it is intended to be, because there still exists the liability of failure of the brake rod. On city cars the steps have been kept low, and with the car steps low the car body must be kept low, which brings the brake rods close to the motors, and the breakage is apt to be in the rod. If further safeguards are required attention should be given either to the pulling lever or the brake rod rather than to the chains themselves.

Mr. A. H. Stanley, of the Public Service Corporation of New Jersey, stated that his company used the stored air system almost entirely, and was so equipping all of the double-truck cars. With a personal experience covering some six or seven years, both on high-speed interurban lines and city lines, he knew of no accident through any fault or defect in the stored air brake system.

His company used the double chain on hand brakes and had had no accidents in connection with which there was any justifiable criticism of the double chain. This was perhaps because the winter conditions were more favorable. He did not consider that a double chain was absolutely essential. A vital weakness in the braking apparatus is in the rods; the slightest defect in the rod is liable to cause an accident, which no number of chains will prevent.

Mr. C. R. Barnes made the point that the brake must be kept in working order to be efficient. A road in the state had equipped 26 of its cars with an emergency brake, but on a test, out of the 26 there were only three cars on which the brake was in an effective condition. This was nothing which could be ascribed to the brake, but did show that the brake had to be kept in proper condition for use.

Mr. W. H. Collins, Gloversville, stated that on what was known as the Hagaman division, in the city of Amsterdam, where there is a 14 per cent grade, there were operated single-truck cars equipped with the Westinghouse magnetic traction brake and the ordinary hand brake. Double chains were not considered an advantage. The ordinary straight-link chain formerly used had been replaced by a heavy twisted link chain. The magnetic traction brake was used as the operating brake, up and down the hill, and in alternately using the hand brake and cutting out the magnetic brake, no trouble had been experienced in operating the cars satisfactorily. As regards airbrakes he believed the important question to be: What is to be done when the airbrakes fail? The ordinary brake is connected with the hand brake, and on a car with type M control if the tail rod breaks the car is helpless. Having recognized that difficulty some time ago, his company in order to overcome it had adopted a device where the cylinder levers go between double guides, instead of running on top of an ordinary guide, and a block is put in which allows sufficient room for the piston to travel the ordinary length, but which serves as a stop for the lever in case of the rod breaking. This arrangement gives a brake on one truck, and the car can be held on any grade with the brakes on one truck.



Safety Device for Brake Rigging.

Mr. L. L. Smith, of Schenectady, said that within the last two or three weeks his company had applied an airbrake to one of its single-truck cars as a matter of experiment, and as far as the working of the brake mechanically or pneumatically was concerned, it was a success. The only question was whether it was necessary or desirable to equip the small car with an airbrake.

In regard to the matter of safety and making emergency stops, with cars equipped with type M controller, Mr. Smith said the condition was a little different from what it was with the type K controller. With the type M there is quite a large frame reverser box, weighing perhaps 100 pounds, that at ordinary times works electrically. If in an emergency the fuse in an operating circuit should be burned out, and if one could get at the reverser it could be thrown in. When the cars of the Schenectady railway were originally equipped these reversers were hung under the car, but to utilize the reversers as a safety device, they have since been put under the seat in the corner of the car, and if through any means the hand brake or airbrake is inoperative, the reverser can be thrown quickly and the car can be stopped by the current.

Mr. Nelson Graburn, of Montreal, stated that the cars used on a long 13 per cent grade were equipped with the Cincinnati type of emergency brake, which is screw-operated.

Mr. A. H. Stanley referred to the use of airbrakes on single-truck cars in Detroit where all cars, both single and double truck, are by city ordinance required to be equipped with air, and said that the use of airbrakes on all city cars has increased the number of accidents materially. The tendency of the motormen was to make spectacular stops, the simplicity of the application of the power, and the great power available, has encouraged the men to take chances unnecessarily, which they would not do with the hand-brake, and also prevented them from appreciating the condition of affairs and the liability of accidents at different points along the line. They could not feel the power exerted by the brakes when applied with the airbrake as they could with the hand brake, and they were prone to take undue chances with the airbrake on the small cars.

Mr. Stanley, replying to a question by Mr. Barnes, said he was opposed to the use of air on any so-called city car, single-truck or double-truck. It had been his experience in New Jersey, where the company was equipping some 2,000 cars with air, that accidents had increased in the case of the double-truck (city) cars with the use of airbrakes. On that part of the system where double-truck city cars have a good hand brake, motormen preferred that brake rather than the airbrake, as a matter of protection to themselves, using the air in an emergency. He preferred airbrakes for suburban cars or interurban cars, because of the weight of the car and the wear on the motorman in handling a heavy car with hand brakes.

Mr. D. F. Carver, of Rochester, said that in view of the discussion it might be asked why it was the double chain was ever proposed and used. He believed that when the double chain was made, there were in use straight-link chains, which are not as desirable as might be, but that the development of the art in making chains had brought out what is called the twisted, tested link, and when that twisted, tested link is used there is perhaps a smaller percentage of failure with it than with anything else used on cars. On the Atlantic coast, or wherever there is salt air, the double chain could be used nicely and produce but few, if any, of the bad results found with it along the Mohawk valley. He believes the trouble that had been had with the chain was due to climatic conditions.

(The meeting took a recess from 1:40 until 2:20 for luncheon.)

When the meeting was again called to order Mr. Barnes stated that the board of railroad commissioners had suggested or recommended to several of the companies operating in the state that they equip their cars with double chain brakes. That recommendation had been made for the past five or six years. But recently they had met managers and master mechanics who said that the double chain brake is a detriment rather than a safeguard in the operation of cars. The opinion seemed to be very general that the double chain brake is not necessary, and under these circumstances the commissioners would appreciate having a formal expression of the association.

A resolution moved by Mr. T. W. Wilson, of Buffalo, that it is the sense of the convention that a double chain on the brake is not an additional safeguard was unanimously adopted.

On motion of Mr. Fassett, of Albany, the president was instructed to appoint a committee of five, three master mechanics and two general managers, to consider the best braking apparatus for different types of cars, and report thereon at the next annual convention.

The next business was the report of the committee on "Proper Height of Car Steps," which was read by Mr. E. F. Peck, as follows:

"It is recommended that the maximum height between the top of rail and first step of all passenger cars of the box type, with 33-inch wheels, be 18 inches, with a minimum height of 14 inches.

"That the maximum distance between the first step and platform of car be 15 inches, with a minimum distance of 12 inches.

"That the maximum distance between platform of car and top of floor of car be 10 inches, with a minimum distance of 8 inches.

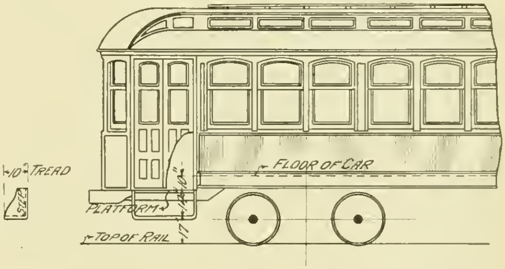
"It is the opinion of the committee that an ideal condition would call for a height of 17 inches from top of rail to the first step, and from the first step to the platform 14 inches, and from the platform to the floor of the car 10 inches, making a total distance from top of rail to floor of car 41 inches. It is also recommended that the tread of all steps be not less than 10 inches.

"A sketch showing these conditions is herewith attached."

The report was signed by E. F. Peck and John Hanf. The third member, Thomas Millen, New York City Railway Company, in a letter to the committee, read by Mr. Peck, said:

"I notice the height of the first step 17 inches, the second step 14 inches and the platform of car 10 inches. I do not see how you could get them much less, where you use the 33-inch wheel. Of course in New York where we use the 30-inch wheel we have our first step 14 inches, second step 12 inches and platform 9 inches."

Mr. John A. Hanf, of Buffalo, stated that the committee found the platforms of box cars all the way from 26 inches to 35 inches above the top of the rails. He thought 32 inches should be the maximum, making the first step 18 inches and the second step 14 inches, and for interurban cars from the platform to the car 10 inches. For city cars the platform could be dropped one inch, making the first step 17 inches. On the Niagara Falls line of the International Railway Company the first step is 19½ inches and the second step is only 12¾ inches; on these cars the second step could be dropped to 14 inches very nicely, reducing the first step to about 17½. With open cars it was difficult with two steps, as first step would be 19 inches, which is too high. The only way to overcome that would be to have three steps, the first one perhaps 14 inches and the other two 12 inches deep. With maximum traction trucks two steps would suffice, by making the first 18 inches and the second 16 inches.



Sketch Showing Heights of Step and Platform from Top of Rail.

Mr. E. S. Fassett pointed out that the trouble with the three-step car is from the person stepping on the third step with the wrong foot. His company had had a great deal of trouble in that respect. It had on the first of the year equipped ten cars with triple steps, and with these cars 20 per cent of the people who got off the cars stumbled. For the two-step car, a high step, or a 16-inch step at any rate, is necessary.

Mr. Duncan McDonald, of Montreal, described the standard steps in use there, which are 16 inches for the first and 12 for the second; from the platform to the car floor is 9 inches. His company did not find any complaint against the 16-inch step, but if this is made 17 inches it causes objection. He thought the reason for the second step being much less is, that after the first step the stairway condition is reached, and for a comfortable stairway eight or nine inches is the limit. He had found that on cars with three steps consecutively without the platform intervening, passengers are very slow and cause a serious loss of time in boarding and leaving the car.

Mr. Barnes asked if the committee thought it possible to make the first step 16 inches and the one from the platform into the car 11 inches.

Mr. Hanf replied that this might be possible on single-truck cars, but not on double-truck cars. The lowest platform practicable for double-truck cars is one 31 inches from the platform to the top of the rail, and that must be divided into two steps or three steps.

Mr. D. F. Carver, of Rochester, described an experimental car with the first step 15 inches from the ground, the next one 13, and the next one 10 inches. This made a nice car to get into, but brought the car platform so close to the wheels that with ordinary springs under the car, the wheels would punch through the floor. To preserve the car it had been necessary to use such stiff springs that the car was very hard riding.

Mr. Barnes stated that the railroad commissioners did not expect railway managers to do anything impossible, and expressed their satisfaction at the attention their suggestions had received at the hands of the association.

The report of the committee on "Height of Car Steps" was accepted.

At the request of the president, Mr. Duncan McDonald, of Montreal, described the "pay on entering" cars used by the Montreal Street Railway Company. He said that the collecting of fares was perhaps the most important part of the business. After contending for a long number of years with the so-called systems of collecting fares, which in most cases are quite unsystematic, his company entered upon an experiment which at present appears to guarantee some very good results. The systems of collections in Montreal had been altogether different from the American system, in that the company had always used a portable fare box. With the portable fare box there were the same deficiences in collecting that occur with the register system. It depended altogether on the accuracy of the diagram that the conductor could keep in his mind during ten hours a day as to the distribution of his passengers, those who had paid and those who had not paid, and depended also on the willingness of the public and on the efficiency of the conductor and on his good will and zeal in getting fares, whether the company got its receipts in their integrity or not.

In considering the question they reached the conclusion that the positive system of collecting fares such as used on the elevated railways and subways in New York was the surest means extant of getting the receipts in their integrity, and with that idea they had applied this system as nearly as possible to the surface cars. The rear platform had been made the paying office for the car. Fares were to be collected on the platform, first, with a view to avoiding accidents by keeping the conductor at all times on the rear platform where he could be fully cognizant of what he was doing in starting the car, at which time most of the accidents on street railway cars occur. The rear platform was the same shape as the ordinary platform, 7 feet long, and divided the back end of the car into two doors, one to the left, which was the entrance door, and one to the right, which was the exit door. The front platform was arranged so as to give an exit there also. With a 7-foot platform the one entrance is as wide as necessary and it can accomodate as many as three persons going in abreast, while the two exits will accommodate about two. A railing extends from the step around the right-hand exit, to the edge of the left-hand door, the conductor standing behind this railing in a space between the right and left door. All passengers coming into the car have to pass to his right. The latest cars of this type had 9-foot platforms.

This system so far had worked very well. It had been found, as nearly as comparisons can be made, that the increased revenue derived from that form of car, compared to other cars running on the same line on the same days, was anywhere from 8 to 15 per cent. This increase was what might be called net profit. If this increase were only 5 per cent, it would equal the average dividend that is paid by corporations in general. Another result of this innovation which offsets a great deal of expense, is the saving of time in the operation of the cars. The facility of discharging by two exits and of receiving new passengers at the same time by a wide entrance reduced the stopping time almost by half.

Mr. McDonald said there were very great moral advantages to this system which could not be properly appreciated in the telling of them. Bearing in mind the searching doubtful looks that are cast by all conductors at respected citizens, and that a look is as insolent as a word, or a whole sentence, it should be apparent that it is an advantage to make the collection of fares as absolutely certain as can be done, so that conductors may not be in doubt as to whether they have received fares from passengers and will not find it necessary to pass these inquiring looks. Managers were often, with the ordinary methods, under the painful necessity of calling upon conductors for missing fares. Perhaps the conductor has missed fares two or three days previous to the time he is called into the office, and cannot remember anything about it. Many managers felt the hardship involved in this matter, knowing at heart the task imposed upon the employe was almost impossible of accomplishment. He believed that the best of conductors missed fares daily, because they had not been provided with a systematic way of securing the fares. As far as the employes were concerned, he could vouch for the fact that all were exceedingly anxious to get on a "pay-as-you-enter car," because it avoided all contention between them and the public and the necessity for the mental diagram which the conductor must make of the passengers in his car, which is very taxing in a well loaded car. With all the effort which the conductor may make to honestly discharge his duty in that direction, and with the utmost striving on his part to preserve a true mental record of whether the passengers have or have not paid their fares, it is still impossible for him to accomplish the task correctly in all respects.

In conclusion, Mr. McDonald stated that two of these cars would be exhibited at the Columbus conventions.

The members then devoted some time to exchanging data on the cost of brake-shoes.

Mr. L. L. Smith, of Schenectady, believed that the figures of one road on cost were of absolutely no value to another road, because conditions are so different. He found that the weight of the car, the speed of the car, the number of stops and the number of grades all entered very largely into the matter of brake-shoe consumption, and as a matter of fact a test on one road is not comparable with a test on another, so that abstract figures would be of no value in comparing brake-shoe costs on one road with any other road, having different conditions.

The subject of sanding track was next taken up.

Mr. John A. Hanf, of Buffalo, asked whether the gentlemen present recommended sand-cars, sand on the cars, or both. His company had had quite a little trouble last year with sand-cars. Flat wheels had increased just 50 per cent over the winter previous, with the same number of cars, and on looking up the sand records, it was found that the sand-cars used 50 per cent more sand than the winter before.

Mr. E. F. Fassett, of Albany, said that he believed in sand cars. His company had tried the sand on the cars in 1890, and had had a great deal of trouble, and as much trouble with flat wheels as at any time since, perhaps more. In Albany the main line had an 8 or 9 per cent grade for about a mile. That grade was taken care of by men 24 hours in the day, 365 days in the year, and kept as clean as a rail could possibly be kept. For the rest of the road they had tried the sand on the cars, but were always having trouble. The sand-boxes were not properly filled at the time they should be filled, the men would not take the trouble to fill them properly and the cars would have to be taken off the line to have the sand-boxes filled. Finally they came to the use of sand-cars, sanding the rails of the entire system on a timetable exactly the same as the schedule on which was operated the equipment for the cleaning of snow and ice. The snow-plows and sweepers were operated on a schedule the same as an ordinary car. The company had snow-plows enough to cover the entire system in an hour and a half, and enough sweepers to do the same thing, so that with the worst kind of storms it was possible to get over the entire system in three-quarters of an hour. A snow-plow was supposed to get back at the barn at a certain time, and if it did not return at that time it was hunted up. Sanding was done in the same way. When sanding was called for by the inspectors the entire line was sanded, using clean beach sand, with no loam in it. The sand used was good for at least five hours under the worst conditions of rail that could be had, so that if the sand-cars went over the system twice a day they were able to keep the rails in very good shape.

Replying to a question Mr. Fassett said that they dried the sand as well as they could. It was impossible to keep the sand dry. The only way was to put it in as large a space as was available, and take it as it fell down. In the sand used there was enough salt to keep the rail in good shape. If ordinary loam sand, either in sand-boxes on the cars, or in sand-cars, were used, the third or fourth car which went over the rail would put the rail in worse shape than it was before. The sand used in Albany cost in the bins about $1.35 a cubic yard or a ton. Using this quality of sand in sand-cars had reduced the proportion of flat wheels.

From the first of November to the first of March, it was exceptional if the rail was not sanded every day. The sanding of the track was one of the large accounts, greater than the snow and ice removal account, but the conditions as to hills were such that it was considered to pay in reducing the accident account.

Mr. McDonald, of Montreal, stated that his company had never tried the sand-car, but had sand-boxes on the cars, and special men for all heavy grades. There were a large number of heavy grades, anywhere from 5 to 10 per cent, and on each of these grades a sand-man was kept for 24 hours a day during the bad season. In the summer time there were three men for two hills employed in sanding about 15 hours a day. Having a man look after a hill was about the safest thing to do, and they did not rely so much on sand-boxes for the hills as on the man who is sanding the hills. These men generally kept the hills in order and the motormen seldom needed to use the sand-box on the car to sand the grades.

Mr. L. L. Smith, of Schenectady, asked that there be a discussion on the best appliances for snow-fighting and the best organization of the snow-fighting force, when the sweeper ought to start in and leave off, and when the plow ought to start in and leave off, and asked to hear from the gentleman from Montreal.

Mr. McDonald, of Montreal, stated that in his city for the last twenty-five years the average snow fall had been 120 inches per year. Notwithstanding the large volume of snow which fell for the past three or four years they had not experienced any stoppage of the service on any part of the lines, with the exception of some interurban lines, on which delays generally resulted when the plows got stuck. For city service the company planned to have a sweeper get around every forty minutes, and where the equipment was sufficient to get over the track every forty minutes there was no possibility of snow falling quickly enough to block the line. In the interurban service the only thing they had found satisfactory was the rotary plow. The company had four motor rotary plows in use, which have given very good satisfaction; with these double-truck rotary plows, with something like 200 horsepower of motors, there had not been any absolute sticking, but at times the speed had been reduced very low. In city service the great need in fighting the snow was to start early. In a light storm a trip every hour and twenty minutes would suffice. The company spent anywhere from $150,000 to $200,000 a year for snow cleaning, and it found that it paid to be liberal in the allowance for snow fighting, so as to avoid any tying up of the lines. The Montreal company had a large number of employes who delighted in nothing so much as fighting a snowstorm, and would work for as long as 75 or 80 hours at a time. During that time the company undertook to care for and feed them liberally.

Mr. Fassett said that in regard to fighting snow his company had only one rule, to begin early and stay late, and the lines had never been shut down on account of snow. He thought the system of running the sweepers and plows on an absolute timetable was quite essential, because then the superintendent or division superintendent would know all the time where any plow was and if it did not come around on time other plows could be sent out to help it and get all started again on time. He had twelve plows and twelve sweepers for 85 miles of track.

Mr. McDonald said that in Montreal they figured on a sweeper for every five or six miles of track; these could get over the entire system in forty minutes.

Mr. Fassett added that his company also had some Waldo road machines, which helped considerably in levelling off the snow. The company had to remove the snow from the streets.

The secretary, Mr. C. B. Fairchild, Jr., stated that compilations made last winter showed that the average for all the roads in the state was eight miles to a sweeper or plow, and the further fact was developed that one sweeper was worth two plows for the first hour or two, and even longer in the case of light snows. The sweepers would do more effective work than the plows until the snow gets to be two inches or more in depth.

Mr. Fassett stated that his practice was to use the sweepers and plows during the time that snow is actually falling and immediately after, and to run a sweeper over the entire line every night during the winter to sweep out the slush and stuff that accumulates on the track during the day.

Mr. McDonald said that in Montreal, to keep ice from forming a ridge in the center of the track an ice cutter in the form of a steel bar with teeth one-half inch apart, which was fastened to the rear truck was used. Several cars on each line were so equipped, the setting being a little different so that every point between the rails would be reached by some cutter. These cutters were hung by springs.

Mr. Graham said that in Buffalo after vainly trying to remove the ice forming between the rails by means of knives attached to the cars or plows, they had secured an ice cutter similar to those used for removing top snow, slush, etc., in harvesting ice for storage. This cutter was drawn along the track by horses and served its purpose admirably.

Mr. McDonald said that he wished to urge that the New York association determine the distance within which a car should be stopped under favorable conditions, and what distance would be considered was a good stop. Such a determination would be of value when litigating damage cases.

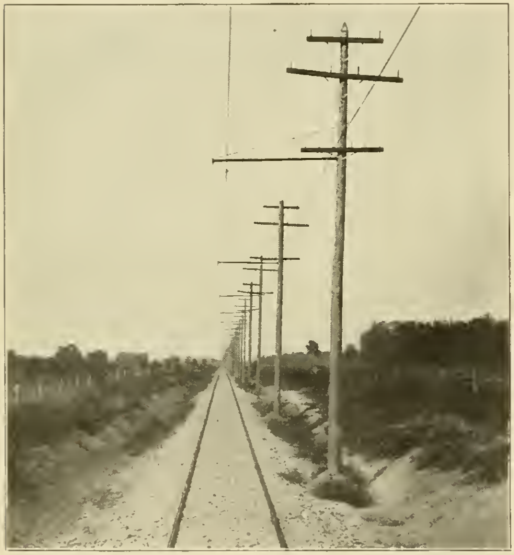
Mr. Fassett, of Albany, said that in 1896 his company had a number of negligence cases, in which an expert ex-motorman testified to the stopping of cars. At that time he had made a series of tests; taking a car and running it at eight miles an hour, and the best stop he could make was 45 feet. He had then decided that in the future the expert ex-motormen should know what they were doing, and had every motorman on the lines of the Albany Railway Company make a test stop, recording the results. For ten years the company had had no more trouble. Every man, when he got up and said what he could do, was confronted with what he had done under the most favorable conditions. It was after this series of experiments had been made that the company changed its rules and did not allow motormen to reverse the car at any time to avoid an accident, except in cases of a breakage of the braking apparatus. At 12 miles an hour, reversing took the gears out, and in one case when running at 20 miles an hour had taken the bottom of the car out.

Mr. McDonald's suggestion was referred to the committee on "Brakes and Braking," with instructions to report at the next meeting.

The meeting then adjourned.

COMPLETION OF THE FIRST SECTION OF THE LIMA & TOLEDO LINE.

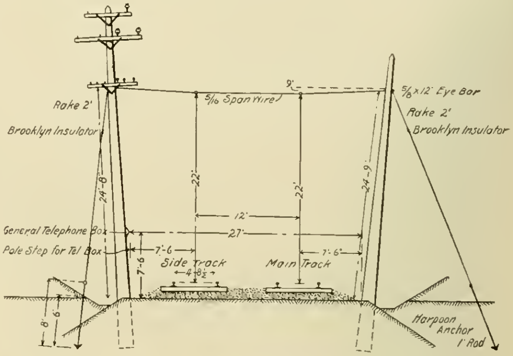
On Saturday, September 15, that portion of the proposed line of the Lima & Toledo Traction Company between Lima and Ottawa, O., was opened for passenger traffic. The general contract for the construction of the line was held by the Stratford Railway Construction Company, which had sublet the work for the Lima and Ottawa section. Owing to franchise restrictions in Ottawa it was necessary that cars be operated on September 15 and on August 17 the situation looked doubtful as to whether the sub-contractors could complete the work in the required time. For this reason the Stratford company took charge of the construction work and under the guidance of Mr. Gaylord Thompson, president, and J. M. Walker, chief engineer, the work on the uncompleted section was energetically carried on so that the cars were operated at 10 a. m. on Saturday, September 15.



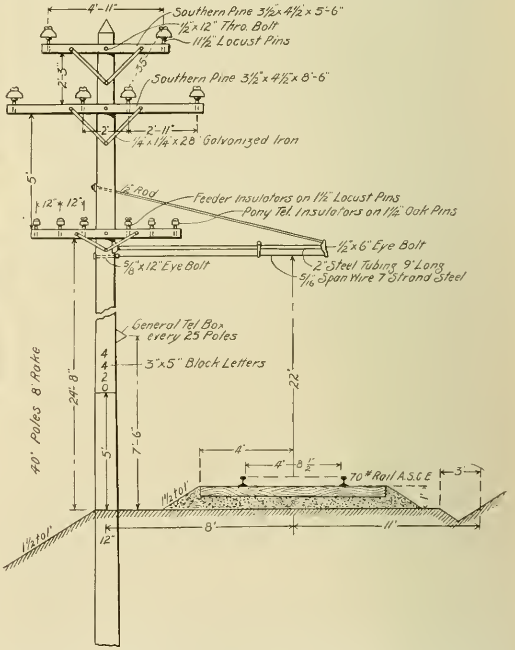
Lima & Toledo Traction Company—View on Long Tangent.

When completed the tracks of the Lima & Toledo Traction Company will connect Lima and Toledo, O. The route practically parallels the Cincinnati Hamilton & Dayton steam road for the entire distance. The roadbed has been constructed with a view to high speed and that portion now built has a maximum curvature of two degrees and a maximum grade of .9 per cent.

Special care has been used to maintain a well-drained roadway. The subgrade in both cut and fill is 16 feet wide on top and has standard slopes. Stone ballast was used, supporting 8-foot ties and 70-pound T-rails. The standard culvert for the smaller drainage areas is a concrete arch with a paved waterway. The small streams are crossed by deck-girder or beam spans with concrete piers. An accompanying illustration shows details of the standard reinforced concrete bridge floor as used in some of the bridges. It will be noted that the track and its ballast are supported on a solid floor of concrete which is reinforced with eight I-beams set vertically. These are spaced with 1-inch rods. The I-beams rest about one-half inch above the under surface of the concrete and on the bottom of the flanges of these beams are laid ½x19-inch bars spaced 3 inches center to center along the flanges. Over these crossbars are laid longitudinal



Lima & Toledo Traction Company—Overhead Construction at Turnouts.



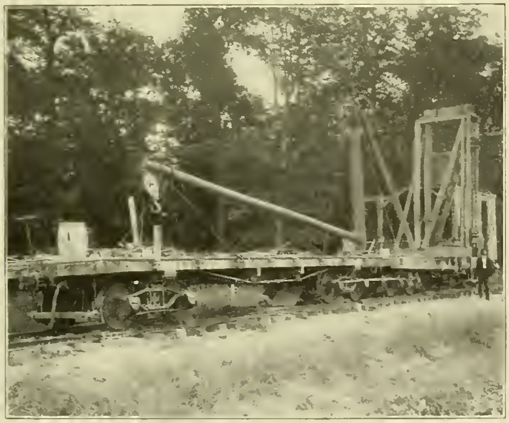
Lima & Toledo Traction Company—Standard Straight-Line Bracket Construction with Two Transmission Lines.

span rods shown in section and the entire flooring is reinforced around its lower surfaces with No. 10 two-inch mesh, woven wire.

On all straight-line work the trolley wire is supported by brackets from 40-foot poles set 6 feet below subgrade. As is shown by an accompanying illustration these poles support, other than the trolley brackets, two cross-arms for carrying two three-phase, high-tension transmission lines and a cross-arm placed about 5 feet below the high-tension cross-arm, supporting telephone and feeder wires. On double-track construction at turnouts the trolley wires are supported by 5/16-inch span wires as shown in one of the illustrations.

Lima & Toledo Traction Company—Concrete Bridge Over Highway—Span of Opening 24 Feet—Height of Opening 16 Feet.

On August 17 there were still 2 miles of track to be laid, 17 miles of poles to be erected, 10.5 miles of feeder and trolley wire to be strung, 10.5 miles of track to surface and 5,500 cubic yards of excavation and embankment to finish at one point where there was a deep cut and a high fill, three-quarters of a mile apart. At this time the entire force consisted of about 80 laborers and seven linemen which number was soon increased to 240 laborers and 20 linemen. The poles were set at the rate of 1.5 miles per day in which work a boring machine was used. This boring machine is mounted on the side of a flat car and the equipment not only includes the tool to dig holes 24 inches in diameter, but also carries a derrick by the aid of which the poles can quickly be set in the holes.

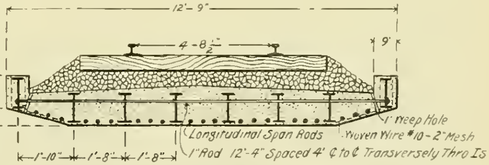


Lima & Toledo Traction Company—Machine for Boring Pole-Holes and Setting Poles.

The feed wire and three high-tension wires were placed on the poles by means of two masts mounted on a car having booms extending from one mast over the cross-arm. The reels of wire were set on jacks at the front of the train and the wire run through snatch-blocks on the first mast above the cross-arms and then through blocks on the two booms of the second mast. This left the various wires lying on their proper cross-arms. With this arrangement of car and booms it is stated that a mile of wires consisting of one 300,000-circular-mil cable and three No. 2 high-tension conductors could be laid on the cross-arms in from 7 to 10 minutes after the connections were made and the reels installed on the cars ready for paying out the wires. The trolley wire was erected in much the same way and temporarily suspended by means of hooks at each pole. About five miles could be put up in one day of 10 hours. On account of local difficulties at Ottawa where the poles had not been set the trolley wire at one or two points was strung from ropes stretched across the streets between trees.

Lima & Toledo Traction Company—Track-Laying Machine at Work.

At the conclusion of the few days of fast work the last 10 miles of line to be completed were in good surface and line. On some portions of the road, however, the track was still lying on the subgrade waiting for stone ballast, but cars can now be operated at about 15 miles an hour.



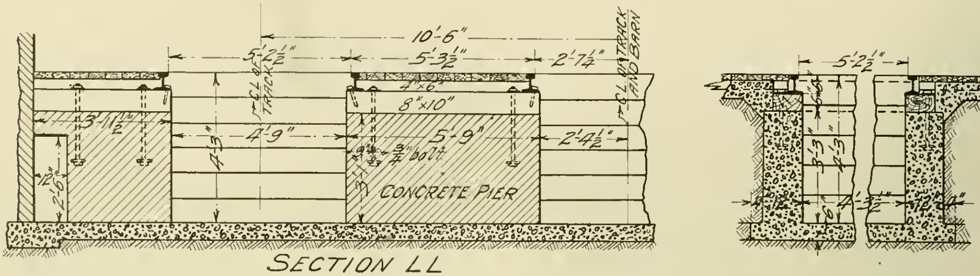
Lima & Toledo Traction Company—Standard Reinforced Concrete Bridge Floor.

Tree Growing by Railroads.

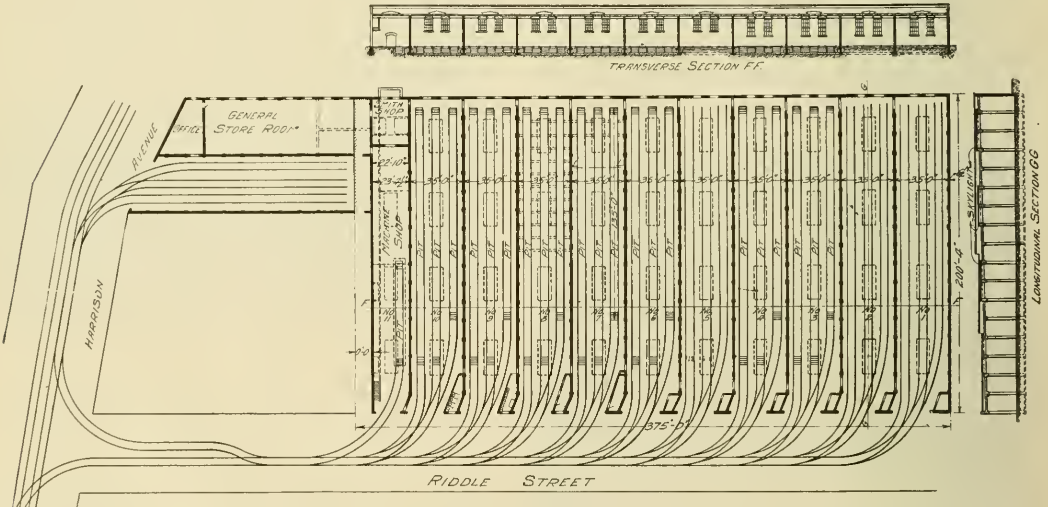
In view of the increasing difficulty of securing an adequate supply of ties and their constantly advancing price, the railroads are turning actively to tree-planting. The Atchison Topeka & Santa Fe has purchased a ranch of 8,659 acres in California and will grow eucalyptus trees, planting about 600 acres each year. As the trees are quick growers, it is estimated that they will be ready for use in twenty years and that each tree will then yield six or eight ties. As fast as one set of trees is cut another will be planted, thus insuring a continuous supply of ties. Canadian roads are making extensive use of the cedar, which is proving highly successful. It is largely immune from decay and provides a steady base for the rails.

BRIGHTON CAR HOUSE, CINCINNATI TRACTION COMPANY.

The Cincinnati Traction Company has under construction a car house at Riddle street near Harrison, which is known as its Brighton car house. The building has foundations of concrete, brick walls and a flat roof of reinforced concrete supported on concrete girders; it has a frontage of 375 feet on Riddle street and is 200 feet deep, and consists of 11 bays separated from each other by solid brick walls having a single opening, which is a doorway 3 feet wide by 6 feet 6 inches high, at the extreme rear of the building. These openings between bays are protected by fire underwriters double doors. Each bay is 35 feet wide between the centers of the walls and excepting No. 11 each contains three tracks. No. 11 is equipped for a machine shop, with a blacksmith shop at the rear end. All the other bays, except Nos. 1, 2 and 5, have pits under all the tracks, as shown in the plan view. The track rails are supported on 8x10-inch yellow pine timbers surmounting cross walls or piers spaced 7 feet 6 inches between centers. As shown in the cross-section of the pits, this leaves the entire space between the two rails of the track clear. Between the tracks the floor is of 2-inch yellow pine and is at the level of the rail. In each bay there are four skylights 8x20 feet, covered with wired glass ¼ inch thick. All tracks of the building are stub-tracks, with entrance from Riddle street. The arrangement of tracks leaves space for a small room at the front of each bay, excepting No. 11. These spaces in bays 1 to 6, inclusive, are to be utilized as sand rooms, those in Nos. 7 and 8 for oil rooms, that in No. 9 for a locker room and that in No. 10 for a toilet room. The company owns a lot fronting on Harrison avenue and extending back to the car house property, which is to be utilized for a general storeroom and office building and a four-track barn for work cars, etc.



Brighton Car House, Cincinnati Traction Company—Detail of Pits in Inspection Sheds and Machine Shop.



Brighton Car House, Cincinnati Traction Company—General Plan of Building and Track Connections.

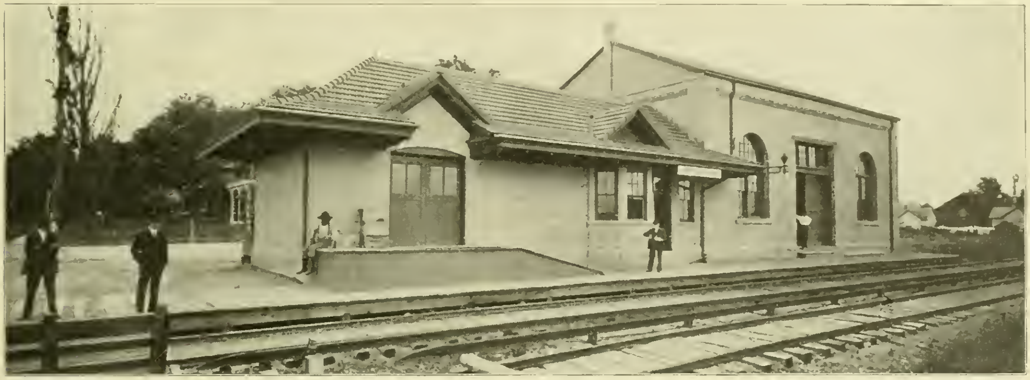
The tracks in bays Nos. 1, 2 and 5, where there are no pits, are laid on ties with cinder concrete brought up to the level of the rail and sloped slightly upward between tracks.

A Swiss Monorail.

Switzerland now has a large number of electric third rail, rack-rail or trolley systems for mountain travel. An entirely novel form of mountain railway is in course of construction up the Wetterhorn, starting from the foot of the upper glacier at Grindelwald. This is an electrically-operated elevated monorail, from which the car bodies are suspended by means of running gear. The cable is stationary, the tractive effort being exerted by motors on the moving vehicles. The alignment approximates the perpendicular. When completed this extraordinary railway will convey tourists through mid-air up to the Gleckstein Club huts, situated 7,695 feet above sea level.

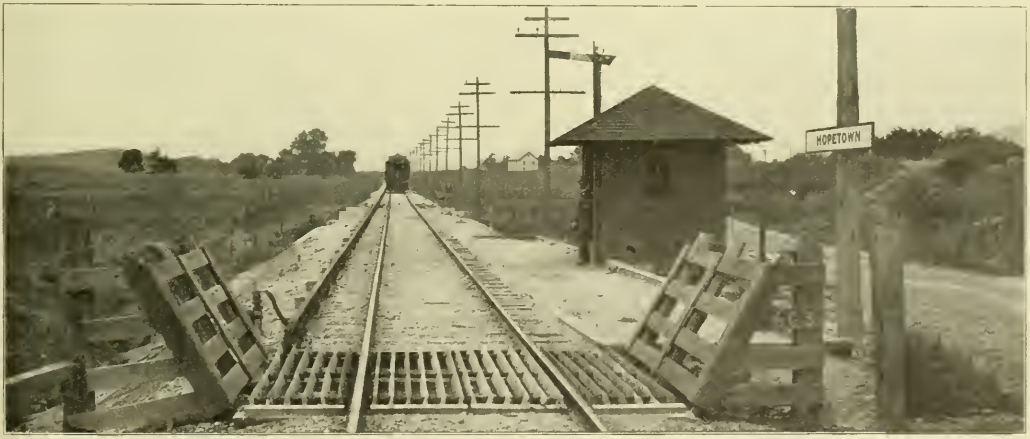
EXTENSIONS AND IMPROVEMENTS, SCIOTO VALLEY TRACTION COMPANY.

In the Street Railway Review for September, 1904, we described the third rail system of the Scioto Valley Traction Company, so far as then completed, and at that time comprising 58 miles of track. The extension from Circleville to Chillicothe, a distance of 20 miles, was built the following year and was opened for operation August 27, 1905. The construction is similar to that of the lines first built, the track being laid with 70-pound rails of A. S. C. E. section in 30-foot lengths, using oak ties 6 by 8 inches by 8 feet. The third rail is of 100-pound T section in 60-foot lengths, supported on vitrified clay insulators at intervals of 10 feet, the ties which carry the insulators being 6 by 8 inches by 10 feet. This line is exceptionally well built and ballasted, 3,000 cubic yards of gravel per mile being used for ballast.



Scioto Valley Traction Company—Combined Freight and Passenger Depot and Substation.

For the operation of this extension three substations similar in design and capacity to those first built, have been added. One is at Circleville, the former terminus of this division, one at Kingston, midway between Circleville and Chillicothe, and the third at Chillicothe. Each of these substations is equipped with one 400-kilowatt General Electric rotary converter and three 150-kilowatt General Electric transformers, stepping down from the line potential of 27,000 volts to 375 volts for the rotaries.



Scioto Valley Traction Company—Standard Open Waiting Station with Train Signaling Device.

In the substation at Circleville are several interesting construction details. The building is of brick with a tile roof supported by steel trusses and purlins. The foundations for the building walls and machinery are of concrete. There is no basement, but a pocket extending under the rotaries and connecting with the switching side of the station, serves for wiring and drainage purposes. The interior of the structure is not subdivided and there is but one entrance, a sliding door on the track side. The building is 57 feet 4 inches long by 34 feet 10 inches wide and contains two 400-kilowatt, General Electric rotary converters.

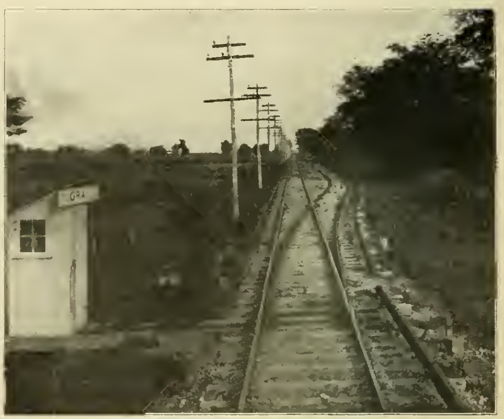
The high-tension lines enter through hoods of reinforced concrete and slate supported on a steel framework under the eaves on the side of the building away from the track. In these hoods the wires are supported on standard insulators. Just inside the building the high-tension lines pass to two sets of disconnecting switches, one to cut the substation off the high-tension line and another to disconnect the bank of multiplex lightning arresters which protects each phase. From the disconnecting switches the line wires pass down the wall on standard line insulators with steel pins set in the brickwork. Connection is made to the current transformers which are supported on the back of the oil-switch compartments. The high-tension busbars are of No. 0000 round copper extending the length of the building and mounted on standard insulators supported on a piperack, which extends over a row of oil switches parallel with the side walls of the building. Above the busbars and row of oil-switches is a steel-concrete gallery affording access to the lightning arresters and disconnecting switches.

Scioto Valley Traction Company—Standard Bridge Construction, Power House in the Background.

The high-potential lines from the current transformers pass through hand-throw oil-switches and connect with the busses. Each oil-switch is set in a separate cell and is provided with an automatic trip. For each rotary there are three oil-cooled, 150-kilowatt transformers which stand in a row parallel with the oil-switches. The low-tension busses are mounted on a piperack directly in front of the transformers. All the wiring on both the high-tension and low-tension sides of the transformers, is exposed to view except the connection to the machines, which are carried in concrete passageways under the floors. Half-voltage taps are led from the transformer coils to a suitable board so that the rotaries can be started from the alternating-current side.

Scioto Valley Traction Company—Freight and Passenger Station at Ashville.

Very shortly after the Scioto Valley Traction Company began operating it bought or built stations at the principal points on the line, including Chillicothe, Kingston, Circleville, Ashville, Lockbourne, Duvall, Obetz and Groveport, Lancaster, Carroll and Canal Winchester. In Columbus a building for station and office purposes was rented. This property is at the corner of Third and Rich streets, opposite the site on which it is proposed to erect a union interurban station for Columbus. The building now occupied by the Scioto Valley Company is some distance back from the street, and in this yard space tracks have been laid so that it is not necessary for the cars to stand in the street. At all of these stations agents are maintained to look after both passenger and express business.



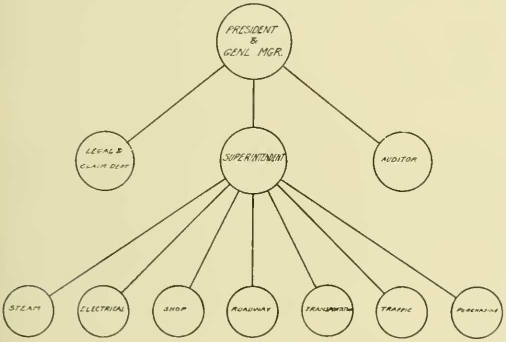
Scioto Valley Traction Company—Standard Sidetrack Showing Manner of Construction of Third Rail and Connections, Telephone Booth and Pole Line.

In addition to the stations which have been mentioned, the company has erected at all flag stops shelters of the type illustrated in one of the engravings. In front of the shelter station is a gravel platform 8 feet by 100 feet, with timber curbing. Shelter stations are lighted and each is provided with a semaphore, to be used by intending passengers in flagging trains. The arm is green, and a green light is displayed at night. Trains only stop at designated points which, on an average are about one mile apart.

Scioto Valley Traction Company—Lockbourne Freight and Passenger Station.

The passenger service is maintained on a headway of one hour on each division during the months of April to October, inclusive. During the other five months, November to March, inclusive, the headway is 1½ hours on each division. On December 2, 1905, the company began handling package freight, making regularly two deliveries each way per day on each division. The car-miles made in each class of service for 13 months ending July, 1906, by months are as given in the following table. The table also shows the consumption of current per car-mile in kilowatt-hours. In the regular service during the summer months there are seven passenger cars and three freight cars:

Scioto Valley Traction Company—Multiple-Unit Train of Three Standard Cars.



Scioto Valley Traction Company—Plan of Organization—Operating Department.

Month.	Passenger Car-miles	Freight Car-miles	Kilowatt hrs. per Car-mile
July, 1905	62,991	......	3.69
August, 1905	68,830	......	3.80
September, 1905	81,866	......	3.61
October, 1905	84,848	......	3.70
November, 1905	68,563*	......	4.08
December, 1905	57,671*	8,100†	4.83
January, 1906	60,028*	8,300	4.87
February, 1906	52,777*	7,039	4.41
March, 1906	57,760*	8,218	4.35
April, 1906	73,726	8,165	3.88
May, 1906	86,953	8,692	3.41
June, 1906	86,664	8,656	3.47
July, 1906	88,942	8,492	3.62

* Winter schedule. † Began freight service Dec. 2, 1905.

Floating Exhibit of British Manufactures.

A novel form of exhibition is being arranged by the Floating Exhibition Syndicate, Limited, in the form of a steamer fitted up for exhibition purposes. This steamer will leave for Montreal towards the end of September, and will then make a tour of the world, showing British machinery and manufactured goods at various ports.

DIFFERENT SYSTEMS OF BRAKES.*

BY H. F. WILLIAMS, ASSISTANT ELECTRICAL ENGINEER, UTICA & MOHAWK VALLEY RAILWAY COMPANY.

With the growth of electric traction, the question of brakes has become a matter of deep importance, and as the present development tends towards the equipment of electric cars with multiple-unit control which will allow them to be operated either singly or in trains of any length, this paper will be devoted almost exclusively to a description of the systems of airbrakes adaptable to this class of service. The conditions to be met in train operation are varied, due to local requirements and several different systems of air brakes have been developed to meet these conditions. The principal requirements are reliability and ease of operation, simplicity of parts, economy in the use of air, ability to make repeated application and release in rapid succession and still be in condition to meet an emergency. The brakes should respond quickly to the controlling mechanism and the release be graduated in such a manner as to make a smooth stop possible.

Brakes For Two-Car Trains.

The first system to be considered is the operation of two-car trains, one car being motor-equipped and the other a trailer which is used only during hours of heavy traffic. To meet this a modification of the familiar straight air system is used. This modification consists in arranging the system so that in event of a break in the air pipes or similar accident, the brakes will be applied automatically and in an emergency a quicker setting of the brakes can be secured than would be possible by use of straight air alone. To accomplish this, a small triple valve and a second train line with the necessary hose couplings is added to each car. This triple valve operates only in case of emergency. The method of operation of this system is this: Main reservoir pressure is maintained in the slide valve chamber of the triple valve and its piston is held in such a manner that it will not travel without a material difference between the pressure on one side and that on the other. The motorman's brake valve is so designed that under ordinary conditions, application and release are made in the same manner as with plain straight air and in service applications, no reduction of pressure is made in the second train line. In an emergency, however, or with a rupture of the train line, the pressure is reduced sufficiently to operate the triple valve, thereby setting the brakes quickly by means of pressure in the second train line. A second advantage gained in the use of this system is preventing the motorman from wasting air by using the emergency for ordinary stops. In case of his doing so, it would require so long to get a release of the brakes that he would soon give up the practice.

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*Read before the Street Railway Association of the State of New York, Albany, N. Y., September 19, 1906.

Another phase of train operation is found in two-car trains having a motor car and trailer but differing from the operation just described in that the trailer is run continuously as part of the train. As there are but two cars, it is possible to use a type of automatic air which has the straight air release and a quick recharge feature in the triple valve which allows the applications to be made in rapid succession without too great a decrease of pressure in the auxiliary reservoir. In this type of brake no graduation is made at the triple valve, but this is accomplished by piping the exhaust from the brake cylinder of the motor car to the brake valve. This brake valve differs from the ordinary type in having two distinct release positions, motor car release and train release. In making a stop, air is applied to the brake cylinder (as in any type of automatic brake) by a decrease of pressure in the train line. To effect a release the brake valve handle is moved to release position which recharges the brake pipe and auxiliary reservoirs and sends the triples to release position, thereby discharging the brake cylinders on both cars, but as the exhaust from the motor car brake cylinder is piped back to the motorman's valve, pressure is retained in this cylinder. Now, by moving the brake valve handle to its second release position this pressure is allowed to exhaust into the atmosphere and the release may be graduated as with straight air. With this system, in order to accomplish a smooth braking, the motor car must be given a relatively higher braking power than that given the trailer, so that when the brakes are applied any slack that may exist between the motor car and trailer will be taken up and the consequent easing up necessary to make a smooth stop will not cause any "chucking" between the cars.

Brakes For Multiple-Unit Trains.

The next system is one which is applicable to two or three-car trains consisting of either all motor cars or motor cars and trailers. This is a condition met in multiple-unit equipment. For such use an automatic system is essential. With it the graduation of application and release are made at the triple valve through the medium of a slide-valve graduating valve. To obtain prompt response of the brakes, feed-valve pressure rather than main reservoir pressure is maintained on top of the rotary valve, quick recharge triple valves are used and reservoirs of rather small volume employed. The maintaining of feed-valve pressure on top of the rotary valve also has the advantage of preventing an overcharge of the train line. While the triple valve used has the feature of allowing a quick recharge of the auxiliary reservoir it is not strictly a quick-action triple. With this system the exhaust from the brake cylinder on the first car of the train can be piped to the brake valve as previously described and the feature of straight air release on the head car thus obtained. This point is desirable in case cars are to be operated in simple units as well as in trains. For a train line, either one or two pipes can be employed. With a one-pipe system the compressors work entirely independent of one another and the labor is very evenly divided between them. If a mixed train of motor cars and trailers is used, a second or control pipe should be added to equalize the labor between the compressors and provide a source of air supply in case the compressor in the front car fails. With a single train line, a failure on the part of the compressor on the head car would force the motorman to go back to the next car having a pump in order to operate his brakes.

The next system to be taken up is the handling of trains composed of four or more cars. As the length of the train increases so does the necessity for a quick-acting triple, owing to the relatively slow flow of air through a long train line. A graduated release and quick recharge are also important items. This system is similar to that used on steam roads, but owing to the fact that the motor cars in the trains are complete units in themselves, a smoother operating brake and a more flexible system may be obtained than is possible where the main reservoir and pump are located on the head car only. With this equipment, straight air release may be secured on the head car, if desired, in the same manner as previously described. A refinement has been recently added to this system called the "quick-service feature," which is an improvement on the quick-action triple. This is an arrangement of the triple valve ports in such a way as to combine brake-pipe pressure with the auxiliary reservoir pressure and so accomplish a quicker charging of the brake cylinder and consequently a quicker application of brakes. This method has heretofore been used only for the emergency application, but with its use in service application the time of serial action of the brakes throughout the train has been reduced about one-half. This permits a smoother handling of long trains. For reasons previously mentioned this system can be operated with a single train line or a double line consisting of brake pipe and control pipe.

Another condition, though one less frequently encountered in electric service, is in handling trains by one motor car or an electric locomotive. This is found in the handling of freight cars or non-motor passengers cars. Under such conditions the compressor, brake valve and main reservoir are on the motor car. On the trailer cars the only equipment needed is a single train line and the usual auxiliary reservoir, brake cylinder and quick-action triple. The brakes are operated in the customary automatic way, and the chief feature distinguishing this from the other systems is an arrangement of a second motorman's valve whereby the brakes on the motor car may be operated together with the train brakes or independent of them.

Electro-Pneumatic System.

The most recently developed system and the most interesting one from an electrical standpoint is known as the electro-pneumatic system. This is not essentially a braking system, but rather an improvement in the method of operation of airbrake valves and may be adapted to any of the braking systems described. It is not designed to do away with pneumatic operation of the brakes, but is a refinement supplementing this method of control. The apparatus needed to accomplish this is a number of electric contacts arranged on the motorman's brake valve, electrically-operated application and release valves, switches for cutting out the current used in the operation of the magnets, a two-line electric circuit through the car with necessary sockets and flexible couplings to connect with other cars and a rheostat of sufficient resistance to allow a flow of about one ampere of current to be used for the opening and closing of the electric valves. The electric portion of the brake valve is a series of electric contacts used in the pneumatic release position and does not interfere with the operation of the equipment by means of air. Thus, if the electrically operated devices fail, the train can be handled by means of the automatic brakes and without interruption. In other words, the pneumatic side of this equipment is left intact and is in reserve for immediate use. The operation of this device in connection with automatic brakes is as follows: The electric contacts on the brake valve being operated in the pneumatic release position, as stated before, the triple valves are therefore in release position, the auxiliary reservoir charged, and the triple valve exhaust open to the atmosphere through the electric release valve. Upon making an application the first point reached completes an electrical connection through the release-valve magnet energizing it and thus closing the brake-cylinder exhaust. The second movement of the handle closes another connection which operates the magnet on the application valve, opening this valve. This operation allows air to flow from the auxiliary reservoir through the triple-valve exhaust into the brake cylinder. As long as the handle is held in this position air will flow into the brake cylinder. To stop this flow it is necessary to move the handle back slightly, breaking the circuit which holds the application valve open, thus closing it. This forms a lap or holding position. Moving the handle back to its original position allows the release valve to open, exhausting the air pressure from the brake cylinder. During all the movements of the electric operation, the brake valve is in the pneumatic release position. Consequently the recharge of the auxiliary reservoir goes on continually. So it will be seen that successive application and release may be made without depleting the auxiliary, and any desired fineness of graduation obtained. With this style of equipment no movement of the triple is necessary and the operation is practically that of straight air on each car. As the valves are operated by electricity, the time element, which is such a prominent factor in automatic airbrakes, is done away with and the brakes on all the cars work simultaneously. This system is not only simple and efficient, but is very economical in regard to quantity of air used, owing to the fact that it is not necessary to partially exhaust and recharge a train line.

This type of equipment has been given a thorough service trial and the results are such as to warrant its further adoption. In fact it would seem that the electro-pneumatic system is the best ever developed for electric railway service where train operation is contemplated and its extensive adoption for this class of service can be only a matter of time.

ANNUAL REPORT OF THE BROOKLYN RAPID TRANSIT COMPANY.

The annual report of the Brooklyn Rapid Transit Company for the year ended June 30, 1906, shows gross earnings of $18,473,328, an increase of $2,139,883 or 13.10 per cent. The net earnings were $8,031,951, an increase of $1,502,377 or 23 per cent, while the balance, amounting to $2,742,953, is an increase of $1,139,733. The surplus, after allowing for all charges and $580,343 for betterments, is $2,162,610, which is equal to 4.80 per cent on the $45,000,000 capital stock. The comparative results of operations for the past three years are shown in the following table:

	1906.	1905.	1904.
Gross	$18,473,328	$16,333,444	$14,738,709
Expenses	10,441,377	9,803,870	8,760,439
Net	$8,031,951	$6,529,574	$5,978,270
Other income	323,936	252,136	211,852
Total income	$8,355,887	$6,781,710	$6,190,122
Ch'ges and taxes	5,612,934	5,178,491	4,801,215
Balance	$2,742,953	$1,603,219	$1,388,907
Betterments	580,343	453,285	383,706
Surplus	$2,162,610	$1,149,934	$1,005,201
Prev. Surp.	984,723	1,594,189	1,747,840
Total	$3,147,333	$2,744,123	$2,753,041
Disc. on bds. and adj. old accs.	1,071,769	1,759,400	1,158,852
Profit and loss surp.	$2,075,564	$984,723	$1,594,189

The gross earnings and operating expenses in detail for the past three years have been as follows:

	1906.	1905.	1904.
Passenger	$17,586,721	$15,649,401	$14,429,546
Freight, mail and express	740,779	560,553	192,957
Advertising	145,808	123,511	132,655
Total	$18,473,328	$16,333,444	$14,755,158
Operating expenses:			
Main. of way and str.	$ 815,147	$ 816,275	$ 615,669
Maint. equip.	1,642,799	1,655,623	1,206,326
Op. power plant	1,609,534	1,356,620	1,501,745
Oper. cars	4,251,337	3,982,568	3,803,574
Am. Ry. Traf. Co.	342,205	301,672	62,331
Damage and legal expenses	973,104	999,527	987,634
General	603,289	552,068	537,265
Freight, mail and express	203,962	139,515	45,893
Total	$10,441,377	$9,803,870	$8,760,439

Not taking into consideration the amount charged off for betterments the surplus, after charges, is equal to slightly more than 6 per cent on the capital stock, but it is the policy of the company to be liberal in the item of betterments and $580,343 was charged off for this purpose. Last year the surplus after charges represented 3.56 earned on the capital stock and the company charged off $453,000 to betterments. The report shows a remarkable improvement in earnings and economy in operation, the cost of the latter amounting to but 56 per cent of the gross earnings, when nothing less than 58 per cent was expected. For the year ended June 30, 1905, the expenses were over 60 per cent.

During the year the assets of the company increased from $121,889,876 to $130,213,891, while $7,939,168 was advanced for construction to leased companies, as compared with $6,974,817 the year before. Cash on hand increased from $1,430,495 to $2,001,559. Treasury bonds stand at $1,175,500, as compared with $2,417,000 in 1905 and $5,724,000 in 1904. Construction expenses of constituent companies were $4,506,275; in 1905 these totaled $2,154,924, and in 1904, $1,816,617.

The capital stock of the constituent companies of the Brooklyn Rapid Transit Company aggregates $929,759, and the bonded indebtedness of the system is $78,690,680; accrued taxes are $818,503, a slight advance over 1905, while interest and rent amount to $642,283, as compared with $636,713 a year ago and $644,459 in 1904. The company now for the first time has a reserve fund, amounting to $571,257.

In his annual report to the stockholders President Winter states that there were in the treasury at the beginning of the year unsold refunding bonds to the amount of $2,307,000, and there were issued during the year on account of construction expenditures $6,582,000, making a total available of $8,835,000. Of these there were sold during the year $7,892,000, leaving on hand $943,000 of bonds which may be sold to reimburse the treasury for expenditures.

In addition, the company expended during the year $4,506,274, for which bonds may be issued under the terms of the mortgage, but had not been issued up to the end of the year.

Regarding transfers President Winter says:

> In March of this year the transfer privilege was materially extended. In May transfer points were increased and restrictions still further removed. In June there were issued 12,700,000 transfers, against 7,300,000 in June, 1905, an increase of 75 per cent. For the year ending June 30, 1904, the number of transfers collected was 56,804,382, or 19 per cent of all cash fares collected. . . . In the year ending June 30, 1906, there were collected 96,455,314 transfers, or 27.26 per cent of the whole number of cash fares handled, and an increase of nearly 40,000,000, or 69 per cent over 1904.

In reporting on the improvements made during the year the president says that 100 steel frame elevated motor cars and 222 convertible surface cars have been received, with 144 of the latter yet to be delivered. Two electric locomotives have been built in the company's shops. Two generating units of the Williamsburg power station have been put in operation, a third will be in use by November 1, and the remaining two before the summer of 1907. Two new substations have been put in use and four more are building, while land has been purchased for two more. The company during the year purchased the Canarsie Railroad Company, a new company organized to take over property and franchises of the former Brooklyn & Rockaway Beach Railroad Company, consisting of about 3½ miles of steam railroad tracks and right of way from East New York to Jamaica Bay at Canarsie.

The British Columbia Electric Railway Company has submitted to the municipalities interested a proposition for an electric railway from New Westminster to Westminster Junction and Eburne, B. C. The work will probably cost $500,000.

TRAFFIC AGREEMENTS WITH STEAM ROADS.

The interchange of freight and passenger business between steam and electric roads is a matter which is obtaining more and more extended interest, and one which, for many roads properly equipped, is being looked to to supply increased earnings. We have obtained expressions for and against interchanging and prorating arrangements, some of which we give below. In general, a few interurbans do not favor agreements of this kind either because they are not equipped to do a freight carrying business or because they believe such a business would interfere seriously with their passenger schedules. The majority, however, which have expressed an opinion, although they have no arrangements with the steam roads, believe that these agreements would result in largely increased earnings to their roads and in advantage to the steam roads also.

With a few exceptions here and there, the steam roads have not favored advances along this line, but on the contrary have shown almost united opposition, because, many of the electric lines believe, the steam roads fear the encouragement of the electrics. The interurbans are in accord in the belief that this opposition on the part of the steam roads should be overcome by inducements in the way of new traffic offered and that a resort to law should be taken only when every possible other course has been exhausted.

One of the lines which has an interchange freight business with steam roads is the Los Angeles Pacific, its business being handled in through cars under through rates on prorating arrangements with the Atchison Topeka & Santa Fe, Southern Pacific and San Pedro Los Angeles & Salt Lake. The joint tariffs are issued by the steam roads. This road considers these arrangements highly desirable and as satisfactory to patrons and to both transportation companies. The freight and express business of this road is similar to that of a steam road, but the passenger business is strictly local. A similar case is that of the Niagara St. Catharines & Toronto, which has joint tariffs and switching arrangements with the Michigan Central and Grand Trunk. This was formerly a steam road, so that the physical condition of the property easily permits interchange of equipment. Likewise the Lackawanna & Wyoming Valley has arrangements with the Erie, Lehigh Valley and Delaware Lackawanna & Western. Joint tariffs are issued and the equipment is interchanged.

The St. Louis & Belleville electric, which has an equipment of 500 coal cars with a capacity of 80,000 pounds each, hauls during the coal season an average of 40 carloads a day which are delivered to its connections, the Terminal Railroad Association of St. Louis and the Southern Railway, at East St. Louis. This coal is carried from the mines located on the electric line in Illinois under a prorating arrangement, the through rate to East St. Louis being 40 cents per ton and to St. Louis 60 cents. Of the 60-cent rate the St. Louis & Belleville receives 32½ cents. The joint tariffs are issued by the electric line and by the Missouri Pacific, the St. Louis & San Francisco and the Wabash. There are no prorating arrangements on other articles than coal, but the road expects to obtain these arrangements without trouble when there is a proper opportunity for mutual advantage.

The Hocking Valley publishes a joint tariff covering carload shipments from points on the line of the Ohio River Electric Railway & Power Company. The arrangement is practically one for switching, the electric line receiving a switching allowance varying from $2.00 to $5.00 per car, according to the distance, empties being carried free. These carloads are moved in the earning morning so as not to interfere with the regular passenger business.

An interesting case is that of the Lima-Honeoye Electric Light & Railroad Company, a line of only 4.6 miles with a freight business consisting of potatoes and hay. It prorates on this freight to all points on the New York Central where such prorating gives the steam road a long haul. The electric line believes that it could double its business if it could secure through rates to points on the New York New Haven & Hartford and other New England steam roads and to western points.

On the Topeka Railway, of Topeka, Kan., freight is permitted to be carried through the streets of the city. This road has a connection with the Santa Fe and switches cars to various industries. The road states that it had no trouble in securing this switching arrangement as soon as it was able to show that the interchange was of mutual benefit and a business proposition.

The Bennington & Hoosick Valley does not handle steam-road cars, but receives from the Boston & Maine at Walloomsac, N. Y., several thousand tons of freight a year. Coal for points on the electric line is switched by the steam road to a siding where it is transferred to a car of the former. The road states that while it competes to a certain extent with the Boston & Maine, for passenger business, the steam road treats its competitor with great fairness. The Chicago & Joliet Electric does a small freight business in the hauling of stone to connections with the steam roads. It has a switching charge, which varies according to distance from 50 cents to $3.00 per car, and which is assessed upon the owners of the stone quarries. Though the cars of the steam roads are used, there are no arrangements with them regarding charges. The American Railways Company which controls the Chicago & Joliet Electric holds that freight business for an electric line busy with passenger travel is undesirable.

In Iowa the state law compels steam roads to make connections with the electric lines and to switch the latter's cars at the same rate at which they switch the cars of other steam roads. Under this law the Cedar Rapids & Iowa City Railway & Light Company has physical connection with the Chicago Milwaukee & St. Paul and the Chicago & Northwestern, but though it has worked hard to obtain joint rates it has been unsuccessful, the railroads refusing to make any arrangements on the ground that they will not recognize electric railways, even though they are capable of handling all kinds of business. The Cedar Rapids & Iowa City is built on a private right of way with a maximum curvature of 4 degrees and a maximum grade of 1½ per cent. In the small towns which it enters it owns depot grounds, and at its terminal in Iowa City has fairly large freight terminal facilities. It also owns grain elevators, lumber yards and coal yards situated along its line. The only way in which it has been able to handle any business for points off its line is to make the haul to its terminal, collecting the local charge, and then to have it rebilled to the point of destination, thus necessitating two rates and two billings. Its officials think the position of the steam companies very unjust and discriminating in view of the latter's joint tariffs with steam roads which are only 20 or 25 miles long, and in view of the fact that the electric line is not parallel to their tracks but serves a virgin territory.

Switching arrangements exist between the Fairfield Traction and the Hocking Valley, between the Joliet Plainfield & Aurora and the Elgin Joliet & Eastern, and between the Lexington Railway and the Belt Line of Lexington, Kentucky.

All the interurbans appear to be of the opinion that traffic agreements with the steam roads should be based on mutual advantages, and that no appeal should be made to state law or to the Interstate Commerce Commission for joint rates and through routes except in a last extremity. There are some lines, however, which have reached this final point. The officer of one road in Iowa says:

I believe that the new interstate law recently passed by congress gives the Interstate Commerce Commission author-

> ity to establish through rates and routes for interstate traffic. We also believe that in order to secure these rates and routes it will be necessary to invoke the law and believe it advisable to do so for two reasons:
>
> First, that the railroads absolutely refuse to make these rates, they having refused not later than the present week to do so with our company and notwithstanding their attention was called to the powers of the Interstate Commerce Commission. They claim that their attorneys hold that the law does not apply to electric railways. In this connection, I might state that I understand that all of the general attorneys of the railways have had a meeting and agreed upon a definite plan of action which they all propose to follow.
>
> Second, if the Interstate Commerce Commission rules that the steam railroads must make joint rates with us and they refuse to do it and the commission does, the electric railways will get a better division of the through rate than they could obtain with a contract.
>
> We are heartily in favor of doing anything that will bring about the joint rates, believing that the electric railways are entitled to them and that the steam railroads are very unjust and discriminating in every way.
>
> We have gone into this matter very carefully and done everything we could to have them recognize our railway but without avail. We are in favor of some concerted action on the part of all of the electric railways. Our attorneys advise that there is no question that the commerce commission will order the rates and routes.

The president of a Pennsylvania corporation has the following vigorous opinion on this question:

> We have no steam railroad connection and the law of Pennsylvania does not give trolley companies the right to handle freight, consequently the necessity for interchange of business does not appeal to us. We expect, however, at the next session of the Pennsylvania legislature they will grant us the right to handle freight and express.
>
> Personally, I would think it advisable to depend more upon the law to force these regulations than upon business negotiations. Steam roads of Pennsylvania have been very antagonistic to electric road development. This may be why I feel that business negotiations for steam roads would be fruitless in this state.

Among the electric lines which desire interchange and prorating arrangements with the steam roads and which have such physical conditions as would warrant an interchange of equipment but which as yet have been unable to secure such agreements are: Cape Breton Electric, Iowa & Illinois, Terre Haute Traction & Light, Binghamton Railway and Choctaw Railway & Light Company.

Trackless Trolley in Italy.

A system of electric omnibuses using an overhead trolley and running over the ordinary road is in operation in Italy between Spezzia and Portovenere, a length of over two miles. The overhead line is double and is held, as usual, upon poles or brackets. Current is taken by a trolley of the Cantons pattern, which is a modification of the bow form, using small rollers to run on the wire. One of the overhead wires is connected to ground, and the system works on 500-volt current from the city plant. The omnibus holds 14 passengers and uses two six-horsepower motors in driving the rear wheels.

American Exports of Electrical Machinery.

In electrical machinery America has a long leadership through the highest type of motor and other electric appliances. The domestic sale of these is enormous, but the surplus for foreign markets went up from $5,645,809 in the fiscal year 1904 to $7,869,137, fiscal year 1906. Canada proved the best customer, taking last year $2,138,134 worth, and the United Kingdom $1,153,528 values. Cuba, which purchased only $31,786 worth of American electrical machinery in 1904, last year took $528,565 worth. The exports to Japan amounting to $726,492 for 1906, was somewhat less than for the two previous years. But that Great Britain was not idle in the electrical field is shown by the doubling of exports in this machinery in comparing the first half of 1906 with the same period of 1904.

WESTERN SOCIETY OF ENGINEERS DISCUSSES SUBWAYS FOR CHICAGO.

At the meeting of the Western Society of Engineers held on September 19, in the society's rooms in the Monadnock block, Chicago, the discussion was based on a paper read by Mr. A. S. Robinson, formerly chief engineer of the Northern Michigan Railroad and at present engineer for MacArthur Brothers of Chicago, entitled, "The Proposed Inner Circle System of Chicago Subway Terminals." Mr. Robinson's plan for relieving the present traffic congestion in the down town business district by a subway loop is, in brief, as follows:

The main feature of the system consists of a central loop enclosing 12 blocks in the congested district, composed of an "inner circle" transfer track and an outer track, separated by a continuous passenger platform. The cars on the inner track are, in effect, sections of a moving platform, moving in the opposite direction to the cars on the outer track, and making frequent stops. The various lines entering the central district all terminate in separate loops, the end sections of the loops being connected together to form the outer track of the main loop. By this system passengers from the outside lines can transfer to the "inner circle" track without delay and be transported to any part of the loop desired. On the outer track through car service can be maintained between the different sections of the city without interfering with the operations of the loop terminals of the independent divisions, because all of the cars on the outer track run in the same direction. Entrances to the subway may be placed at suitable intervals, anywhere along the sidewalks, and may be as numerous as traffic demands. Mr. Robinson stated that he had used a 12-block loop in his paper only as an example; that it might be made larger, and provided for the extension of the business district by a system of cross lines south of the central district forming loops which some cars might use without entering the loop. He also stated that no complete transportation system could be evolved until the present systems were all united under one operating head.

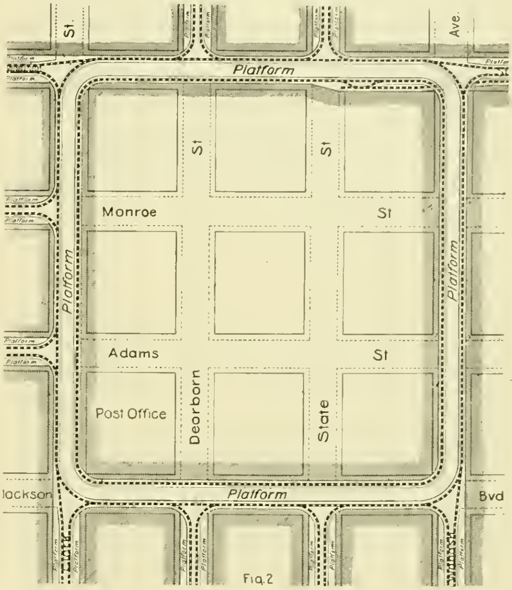


Fig. 2

Proposed Inner Circle Subways for Chicago.

Mr. Robinson's plan met with little favor among those who spoke on the subject. The discussion was opened by a letter from Mr. Bion J. Arnold, consulting engineer for the city of Chicago, which was read by the secretary. Mr. Arnold expressed his pleasure that the question of a subway for Chicago had been brought before the society, but was unable to agree with Mr. Robinson in regard to his proposed plan. He stated his belief that any transportation system for the city should embody the through-routing principle, thus tending to lengthen the business district north and south, and also doubled the passenger-carrying capacity of Mr. Robinson's loop. He said that Mr. Robinson's plan made the loop principle the fundamental feature, with the through-routing scheme as supplemental, whereas his own plan for a down-town subway, which was recently submitted to the local transportation committee of the city council, made the through-routing principle fundamental and the loop supplementary.

Mr. C. V. Weston, chief engineer of the South Side Elevated Railroad, read a paper in which he agreed with Mr. Robinson that nothing should be done in the way of improvement which does not have reference to the unification of the entire local transportation system under a single operating head, but he disagreed with the plan of using a loop in the business district, saying that it would be a perpetual barrier to the establishment of through routes.

Mr. Weston said that Chicago was, in effect, a long and narrow city, that the north and south streets were the natural main trunk lines of the local transportation system, and thought the best solution of the problem was to establish through routes on the north and south lines, with frequent cross lines, forming loops. He said that the capacity of the inner loop system would not be over 60,000 persons per hour.

Mr. George Weston, of the Arnold Company, Chicago, also differed from Mr. Robinson in regard to the practicability of making the loop system the essential part of a comprehensive system of transportation for a large city like Chicago. He estimated that the population of Chicago would increase in 50 years to from 5,000,000 to 13,000,000, and that the system should be so planned as to permit the unlimited enlargement of the business district, the delivery of passengers from any division of the city to any part of this enlarged district without transferring, and the passage of the greatest possible number of cars through this district from and to all parts of the city. He considered that a system with the through-routing of cars as its main feature would solve the problem in a more satisfactory manner.

Mr. H. B. Fleming, superintendent of way and structures of the Chicago City Railway, thought that the inner circle system would be inadequate to handle the traffic which it is expected that the next five or ten years will develop. He was in favor of through-routing and suggested loops north and south of the business center where cars could be turned if desired.

Mr. M. B. Starring, general manager of the Chicago City Railway, said that Mr. Robinson's scheme was in keeping with the desires of Chicago people, who all want to leave or arrive at State and Madison streets at the same time and on the same car. He doubted if Chicago would need an underground system for some time to come and thought that the vehicles should be run underground rather than the people, who want light and air when they travel, except for considerations of speed.

Mr. Walter L. Fisher, the city's traction adviser, said that he was committed to the through-routing principle and that that had been the policy of the city council since Mr. Arnold's report of 1902 was submitted. He thought that the city was committed to the use of the river tunnels, and that cars using the tunnels should not be allowed to come to the surface inside the business district, but that passengers from the north, south or west sides should be carried from one part of the city to the other without transferring down town. He said that it would cost no more for a north side car, for instance, to come down-town heavily loaded and run to the south side comparatively empty, than to return at once empty to the north side. If cars were run clear through the city, he said, the business district would be automatically extended, north, south and west, as a business establishment would not then be at a disadvantage because of being situated away from the terminals of the lines.

RULES FOR TRAIN OPERATION AND DISCIPLINE OF THE SCIOTO VALLEY TRACTION COMPANY.

When the Scioto Valley Traction Company commenced operation in 1904 the question of rules was very thoroughly canvassed by the management. The conditions involved the operation at high speed of trains of two classes (consisting of heavy and costly cars) over a single-track road not equipped with block signals. Except that there were to be fewer cars in a train and that the motive power was to be electrically supplied through a third rail, the conditions were in all respects similar to those confronting a steam railroad of the same length, and it was considered that safety could best be secured by employing as motormen only men whose training had been such as fully to teach them the responsibility involved in driving a high-speed train, and having them work subject to rules, the propriety and sufficiency of which had been demonstrated in practice.

It was considered that the rules and regulations for the government of employes in the operating departments of steam railroads commonly known as the "standard of rules," and embodying the results of the experience of such roads, was the only proper code to follow in operating an electric line where conditions were in so many respects similar to those on steam railroads. Accordingly, the standard rules were adopted, with but two changes, which were:

1. The life of a train was made two hours instead of a longer period.
2. In the definition of trains the word "motor" was substituted for the word "engine."

Applicants for employment as motormen were required to have had experience in working under the standard rules governing operation of steam railroads and to pass a prescribed examination which showed their thorough understanding of these rules. Men who had no such experience were hired as conductors, but after four months' service they were to be required to pass satisfactorily the motormen's examination. (The questions of the Scioto Valley company for examination in transportation rules were published in the Street Railway Review for September 20, 1904, page 567.)

The company found no difficulty in getting men who had had the desired experience for motormen and 90 per cent of the motormen employed were men with experience as enginemen on steam railroads, the other 10 per cent being men who had served as conductors or firemen. A number of the Scioto Valley motormen have resigned positions as enginemen, the advantages of service with a traction company being shorter runs, more agreeable hours and ability to live at home.

It was the idea that inexperienced men taking positions as conductors would in a short time qualify themselves for promotion as motormen, but it has been found impracticable to enforce the requirement that conductors should within four months be able to pass the examination required for motormen. The difficulty lies in the fact that to acquire respect for the rules, realization of the necessity for strict discipline and of absolute submission to it, and experience in the exercise of the authority and judgment incident to the driving of a car, is a matter of years. After two years of operation there is yet no conductor who has achieved promotion to motorman, but there are now several men in the service as conductors who have made themselves eligible for promotion when the next vacancy occurs.

The Scioto Valley Traction Company has not adopted any hard and fast schedule of punishments for infractions of the operating rules. There being only about 25 conductors and 25 motormen, the general superintendent has such close personal knowledge of each man that each infraction of the rules can be treated as an individual case. For a larger organization the Brown system of discipline is favored.

The trainmaster devotes his entire time to the inspection and instruction of the trainmen, and the aim of the management is to have this instruction so thorough that there can be no failure to observe rules because of ignorance. The degree of success attained may be judged from the statement that during the last year there has been no instance of a train employe attempting to make an excuse for violation of operating rules.

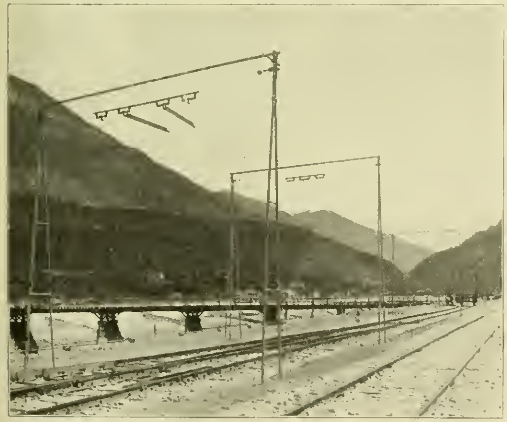
ELECTRICAL EQUIPMENT OF THE SIMPLON TUNNEL.

BY DR. ALFRED GRADENWITZ.

At each end of the Simplon tunnel, which is about 12 miles long, are hydraulic plants formerly supplying power for use in building the tunnel, but which have been adapted for feeding the three-phase trolley system until such time as a larger generating station may be erected. This adaptation of old plants for supplying current for so important a line, was made necessary by the late decision to dispense with the use of steam and operate all lines through the tunnel with three-phase electric locomotives.

Power Supply.

The current is generated in the two stations at a potential of 3,300 volts, 16 cycles, which pressure is quite suitable for the direct feeding of motors without the intervention of step-down transformers. The Brigue power station is provided with a three-phase alternator of 1,200-horsepower normal output, operated through belt transmission from two 600-horsepower turbines constructed by Escher Wyss & Co., the available head being 44.6 meters. This set is able to stand a momentary overload of upwards of 1,500-horsepower. The excitation of the alternator is supplied by a 55-horsepower dynamo.



Simplon Tunnel—View of Overhead Construction at Switch.

As the turbine had not been provided orginally with an automatic regulator, a hydraulic resistance of a capacity sufficing to absorb the whole of the energy produced by the alternator had to be inserted in the circuit of the latter, in order to maintain the speed constant. An automatic regulator adjusts the capacity of this liquid resistance according to the energy requirements of the circuit so as to keep the alternator at full load, whenever it is not loaded to its full capacity by the trolley circuit, thus avoiding any variations in speed. All the instruments and apparatus required in measuring and controlling the current are arranged on a switchboard, connection with the trolley wires and rails being effected by overhead wires.

Simplon Tunnel—General View of Tracks and Station at Brigue.

At the Iselle power station (which is the former pumping station) a three-phase alternator of 1,500-horsepower normal output was installed. This is coupled directly to a double hydraulic turbine manufactured by Messrs. Picard & Pictet of Geneva, each section yielding in normal operation 750-horsepower. The turbine operates at 960 revolutions per minute under a head of 140 meters and is provided with a hydraulic precision regulator maintaining the speed constant. This set will stand temporary overloads of as much as 1,800-horsepower. Its excitation is supplied by a continuous current dynamo of 95-horsepower, 125 volts. The current is controlled and measured in the same way as at the Brigue power station.

Transmission Line.

As seen from the schematic view two of the phases are carried by overhead conductors and the third phase of the current by the rails. The whole of the line is divided into the following sections: From Brigue station to entrance of tunnel; northern half of tunnel; crossing in center of tunnel; southern half of tunnel, and from tunnel end to Iselle station. Circuit interrupters have been provided at Brigue, Iselle and in the middle of the tunnel, the personnel in charge of which are informed by telephone, whenever the lines are to be put in or out of circuit.

The overhead wires outside of the tunnel are fixed at intervals to transverse span wires strung between double iron-pipe poles situated on either side of the track. On curves these poles are reinforced by a third support intended to increase their flexional strength. A separate system of poles for each track has been provided at Brigue, thus assuring a rigid support for the trolley wire, apart from enabling either of the lines to be adjusted without altering the other one. At Iselle the tracks approach too close to each other to allow of poles being placed between them, so the transverse wires had to be suspended from two poles situated on either side of the total width of track, on the chain-suspension principle.

In the tunnel itself the trolley lines are fixed to span wires fitted to the walls by means of bronze pieces cemented directly into the tunnel lining. In order to warrant a substantial design, the transverse suspensions were made of one piece throughout their length, avoiding the use of any insulating balls, etc. They are provided at each end with a piece of porcelain carrying a device to regulate the tension of the wire. These suspensions are placed 25 meters apart on the straight track, and 12.5 meters on curves, it being unnecessary to choose these distances any shorter as the relatively constant temperature of the tunnel allows the trolley wires to be stretched very tightly.

To avoid an excessive drop in the tunnel (about 20 kilometers, 12 miles in length), the cross section of the wires had to be made greater than outside of it (where trolley wires eight millimeters in diameter were used), it not being intended to use transformers. Now, there were two possibilities, according as either a single wire of large diameter or two wires of smaller cross section were employed. The second alternative was preferred, mainly because of the greater ease of handling wires of smaller cross section and of the greater contact surface offered by two wires for each pole. Moreover the operation of the line will not be discontinued in the event of either of the wires breaking, the other serving to conduct the current until the current is switched off to replace the broken wire.

The trolley wires are fixed to the spans by means of insulators of special design, consisting of two insulating materials (hard rubber and porcelain), so as to ensure a perfect insulation and to cope with such unfavorable working conditions of the line as high temperatures, moisture, etc.

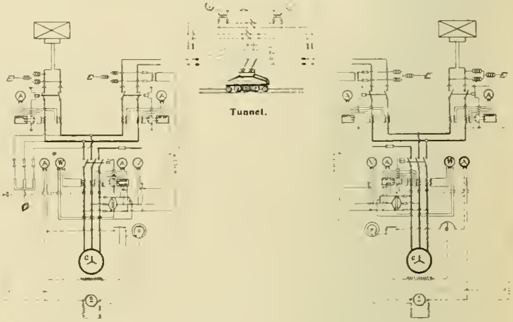
These insulators are made up of a hard rubber bolt to which the trolley wire is fixed and which is carried by a bronze beam the ends of which are rebated deeply in substantial porcelain insulators. In order to increase the elasticity of the joint, the ends of the bronze beams, before being screwed to the insulator, were surrounded with hemp and asbestos, the whole being fixed to the transverse wire by means of bronze pieces to which the ends of the porcelain insulators were solidly fitted.

Simplon Tunnel—General View of Yards at Brigue Station Showing Trolley-Wire Suspension for Parallel Tracks.

These insulators assure a high degree of safety. In fact should either of the insulating materials become damaged, the other would offer resistance enough to prevent any losses of current and to allow of a provisional continuation of the service until there is an opportunity of repairing the defects, the repair work being carried on very quickly, as each of the pieces of the insulator may be replaced separately.

In normal working order there is carried out a periodical revision of the insulators, each of which is able to stand a normal tension of as much as 18,000 volts. Each of the parts of which the insulator is made has been tested separately at 10,000 volts, so that the whole of the insulator is able to stand a tension of 30,000 to 40,000 volts, which even in an unfavorable atmosphere such as surrounds the apparatus, may be considered a sufficient guarantee for the working tension of 3,300 volts.

In order to ensure a wear and tear as regular as possible of the contact bows, the trolley line has been arranged in zigzag on the transversal suspensions. The third phase of the current, as has been stated, is carried by the rails, joined according to a special system of Messrs. Brown, Boveri & Co., the characteristic feature of which is that mechanical joints are used to conduct the current from the end of one rail to the beginning of the following, the use of any electrical joints or connecting copper cables being avoided. In order to make this joint, all the surfaces through which the current is to pass are first scoured by means of a sand jet from a special blower. After the surfaces have become quite smooth they are coated with a layer of a special paste intended to prevent any oxidation of the contact surface. After this the fish-plates are bolted in the ordinary way and the connection is established permanently. This simple system has given very satisfactory results wherever it has been employed, it being found in connection with recent tests made at Brigue that the conductivity in the joints is equal to that of the homogeneous rails.

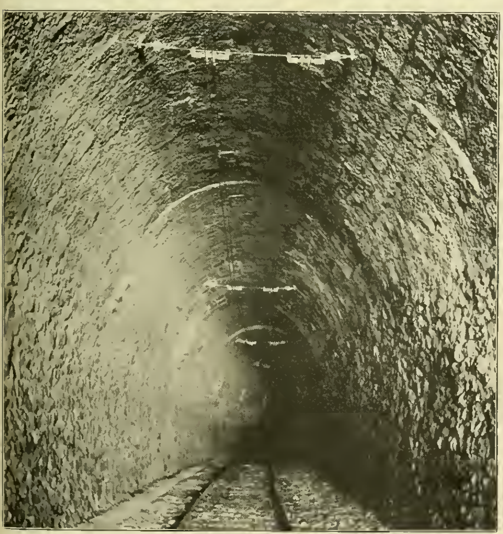


Simplon Tunnel—Schematic View of Two Power Stations and Switching Station in the Tunnel.

Current-Collecting Devices.

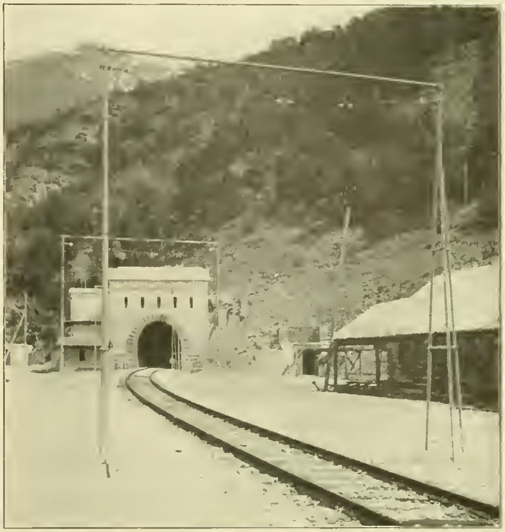
The two current-collecting devices are placed in front and at the back, respectively, of the locomotive roof and are made up of two parts, the lower one being a jointed parallelogram, while the lower part is the current-collector proper. The latter has lighter joints and is supported by the upper side of the parallelogram, its run being limited on both sides so as to be able on the normal track (the height of the line being 5.2 meters) to oscillate freely without displacing the parallelogram. In the tunnel (the wire being 4.8 meters in height) the jointed system will, however, be lowered completely. Contact is made by means of a compressed air piston controlled by a valve which by tightening or loosening the spring will lift or lower the contact bow. After the locomotive has been at rest, as there is no compressed air available, contact is made with the bows by means of a small hand pump, the compressor being taken into operation again as soon as the contact with the line is obtained.

The energy required for the air compressors and for part of the lighting plant is transformed by a 7-kilowatt, 3,000-110-volt transformer. This small oil-bath transformer is bolted to the locomotive floor and connected to the ground. The air is compressed in two Christensen plunger compressors, operated by small electric motors, and intended to furnish the compressed air required for the operation of the Westinghouse brake, to feed the whistle, the sander and the pneumatically controlled apparatus. Each of these compressors will compress 415 liters of air per minute at a pressure of 7.5 atmospheres, which air is stored in four cylindrical reservoirs situated in sets of two on either side of the locomotive. The compressors are started either by means of a hand switch or automatically by the aid of an electro-magnetic regulator cutting their motors out of circuit as soon as the normal pressure of 7.5 atmospheres is attained and completing the current again as soon as it drops below a given minimum. All the compressed air conduits are provided with check valves, allowing either of the controllers to be worked so as to always have one in reserve.



Simplon Tunnel——Suspension of Trolley Wires in Tunnel.

The lighting current is supplied partly from the 7-kilowatt transformers and partly from a train lighting outfit on the Aichele system, mounted on the locomotive. The lighting inside of the locomotive has been reduced to a minimum in order not to trouble the motorman. Only a single incandescent lamp has therefore been arranged for general lighting purposes, which lamp may be put out by means of an independent switch operated by the motorman whenever he may dispense with it. Two incandescent lamps with reflectors have been installed to light the measuring apparatus. A few current connections have been further provided on the locomotive allowing a portable lamp to be connected for inspecting or oiling the locomotive.



Simplon Tunnel—Tunnel Entrance at Brigue Showing Standard Overhead Suspension.

All the measuring instruments as well as the low-tension switches are assembled on two small marble switchboards placed on the walls of the cabin, while the high-tension measuring apparatus (which are traversed only by currents of 40-volts maximum tension) have been mounted on small marble panels arranged above each controller.

Indiana Union Traction Company Rearranges Power Equipment.

The Indiana Union Traction Company, which recently acquired the Indiana Northern Railway, the Muncie Hartford & Fort Wayne Railway and a part of the Dayton and Muncie properties, is doing considerable work in rearranging the power equipment. The generating apparatus in the power house of the Indiana Northern at La Fontaine is being removed and a high-tension transmission line built to this station, which will hereafter be operated as a rotary converter substation, supplying the section between Marion and Wabash. The power plant of the Muncie Hartford & Fort Wayne at Eaton might possibly be similarly changed and operated as a substation. The machinery in the repair shops at Eaton and Winchester will be removed to Muncie, the present shops at Eaton being utilized for paint shops only and those at Winchester for storage purposes. That section of the Dayton & Muncie Traction Company between Muncie and Union City is now comprised in the Indiana Union Traction system and is known as the Union City division. The Muncie Hartford & Fort Wayne from Muncie to Bluffton is known as the Muncie-Bluffton division. The eastern portion of the Dayton & Muncie from Union City to Greenville is now a part of the Indiana Columbus & Eastern Traction system.

FALL MEETING OF THE CENTRAL ELECTRIC RAILWAY ASSOCIATION.

The first regular meeting of the Central Electric Railway Association after the summer's vacation was held at Robinson Park, Ft. Wayne, Ind. The ladies accepted the association's invitation and a large number were present. About 130 ladies and members enjoyed a chicken dinner in one of the park pavilions.

The association was called to order by President Spring at 12 o'clock, the meeting being held in the park theater building. The secretary read the announcement of the meeting and the minutes of the meeting held at Dayton, O., on May 24.

The standardization committee, of which Mr. W. H. Evans is chairman, reported that it would recommend to the association for further recommendation to the American Street & Interurban Railway Engineering Association the following standards: M. C. B. "Christie" brakeshoe, head and key; M. C. B. journals 3¾x7 inches, 4¼x8 inches and 5x9 inches with standard bearing and box; wheels with 3-inch tread and a flange ⅞-inch high and 1 3/16 inch thick; A. S. C. E. standard section T-rails.

These standards were discussed and a motion later was carried recommending them to the standardization committee of the American association.

In discussing the wheel contour as recommended, Mr. L. C. Bradley, of the Scioto Valley Traction Company, favored the recommendation of a deeper flange and wider tread, stating that any standards that were adopted at this time must be suitable to meet future conditions and that as traffic increases larger cars will be used and wheel sections approaching M. C. B. standards will then be needed. If the larger wheel flange and tread were recommended at this time special work when being renewed could be designed to accommodate the increased size of flange.

Mr. F. A. Bundy, of the Lima & Toledo Traction Company, held the opinion that the dimensions as recommended were sufficiently large. He stated that he had observed the operation of cars with several sets of wheel dimensions and felt sure that those suggested were amply large from the standpoint of safety.

Mr. H. A. Nicholl, Indiana Union Traction Company, stated that his company had experienced no difficulty from derailment with ⅞-inch flanges and that 3-inch tread had been adopted for the wheels used under the Indiana Union Traction Company's cars.

The committee on lightning arresters reported that it now has its work well in hand and has appointed a subcommittee to carry on the detail work and report to the lightning arrester committee some time during the week of the convention at Columbus. The subcommittee consists of George Whysall, M. Baxter and M. J. Kehoe. Following the plan laid out by the lightning arrester committee this subcommittee will formulate for discussion a set of data sheets, later to be distributed to the member companies of the Central Electric Railway Association and made complete from observations by the various department heads of the operating companies. With these data it is expected that valuable improvements can be made in the existing types of lightning arresters.

Mr. C. R. McKay next read a paper on the subject of lightning protection for high-potential lines. This paper will be found elsewhere in this issue of the Electric Railway Review.

The meeting then adjourned for the members to partake of the chicken dinner.

While in the dining hall the following motion was made and unanimously passed by the members of the association, that the secretary be instructed to send a telegram of good wishes to Mr. C. D. Emmons, general manager of the Ft. Wayne & Wabash Valley Traction Company, through whose courtesy they enjoyed the pleasant outing at Robinson Park.

The president stated that there had been some discussion of the subject of sprinkling in the state of Ohio and for that reason requested the secretary to read House Bill No. 25 passed by the 77th assembly of the State of Ohio. The substance of this bill is that municipalities may require electric railways to sprinkle along their tracks; if the railways fail to do this then the city may do the work and charge the corporation according to law.

President Spring complimented the association on the fact that it had been favorably recognized by the American Street & Interurban Railway Association. Secretary Merrill will be quartered at the convention hall with Secretary Swenson. The management of the Columbus Railway & Light Company has announced that storage tracks will be available for private cars in the city of Columbus and President Spring requested that all members who could conveniently do so should travel to Columbus in their own cars.

Secretary Merrill read the treasury accounts of the association which showed that if all obligations are promptly met by the member companies, the finances of the association will show a substantial balance at the end of the year.

During the afternoon the members and guests witnessed a baseball game played by teams representing the states of Ohio and Indiana, after which a vaudeville performance was given in the theater building at the park.

DISCUSSION OF STANDARDIZATION, CENTRAL ELECTRIC RAILWAY ASSOCIATION.

An informal meeting of representatives of the mechanical department of companies which are members of the Central Electric Railway Association was held at the Aveline Hotel, Ft. Wayne, Ind., on September 26. The purpose of this meeting was to formulate some acceptable standards which can be presented as a recommendation of this association to the standardization committee of the American Street & Interurban Railway Engineering Association.

At the suggestion of Secretary Merrill, Mr. W. H. Evans, superintendent of motive power of the Indianapolis Traction & Terminal Company, acted as chairman.

Mr. Evans stated that the subject of standardization of rolling stock is an especially important problem that is being considered by the engineering associations. The standardization of trucks and running gear of cars should receive particular attention at this time as the mergers of many companies bring together various types of equipment that can be maintained and operated successfully only when common standards are used. The subjects of brakeshoes, journals and journal boxes, tread and flange of wheel and rail sections, should be considered first. The speaker considered that of these subjects brakeshoes is the most important topic and he urged that the representatives of the Central Electric Railway Association should go to Columbus prepared to urge the adoption of a suitable set of standards.

A number of representatives held the opinion that the M. C. B. standards for brakeshoes, journals and truck parts should be adopted, but Mr. Evans did not think it wise to adopt the M. C. B. standard wheel tread and flange. He suggested that the various subjects be then discussed and a recommendation be made to the standardization committee of the Central Electric Railway Association so that if satisfactory, it could be approved and forwarded to the American Street & Interurban Railway Engineering Association.

Mr. L. M. Jacques, master mechanic of the Ft. Wayne & Wabash Valley Traction Company, thought that the subject of wheels should first be discussed and recommended the following dimensions: Three-inch tread with a flange ⅞ inch high and 1 3/16 inch thick at the throat.

Mr. W. N. Bloss stated that these dimensions are now quite generally standard and wheels so designed can be satisfactorily operated over nearly all existing tracks and special work.

Mr. George Davis stated that he had recently visited 17 different properties with a view to securing such data as were being considered and had found that the general tendency is to use a wider and deeper throat in new special work and that a number of roads use wheels with flanges 1 inch high.

Mr. Evans stated that some of the steam roads have considered reducing the depth of the flange on their M. C. B. wheels from 1⅛ to 1 inch high.

The subject of the proper rail section to be recommended was next considered. Mr. Evans stated that at Indianapolis some of the track was originally laid with a 91-pound 8-inch Shanghai T-rail, but on new track the same type of rail weighing the same per yard, but 7 inches high, is laid.

Mr. E. S. Nethercut cited the experience with T-rail construction at Minneapolis, saying that the Twin City company of that city was the first to use 60-pound rails 5¾ inches high in city streets. A 6-inch T-rail is sufficiently high to accommodate standard brick pavements. The T-rail sections are made as high as 8 inches weighing from 60 to 96 pounds per yard. Some of the advantages to be gained in using this type of rail are a lower first cost, less maintenance expense and less pounding by wheels as there is no opportunity for the flanges to ride. The use of T-rails in streets has proved satisfactory in many cities and there is less trouble from joints with this type than with the ordinary types of girder rails. The speaker favored the use of sections as recommended by the American Society of Civil Engineers.

Mr. Evans stated that at the Detroit convention of the American Street Railway Engineering Association a 7-inch T-rail with a 3-inch head had been recommended, but that some roads had experienced difficulties with municipalities regarding the use of this section. The use of the T-rail section will assure that any type of wheel tread can be used.

The subject of brakeshoes was next considered. Mr. Evans suggested that little difficulty would be found in adopting the M. C. B. brakeshoe standards. It is an important point to have a uniform standard for brakeshoes and attachment so that the foreign cars can be fitted with shoes at any shop of the various roads over which they operate. A motion was then made and carried that the M. C. B. type of shoe including the head and key be recommended.

The subject of journals and journal boxes was next discussed and a motion was passed that the following M. C. B. standards should be recommended: 3¾x7 inches for light cars, 4¼x8 inches for medium weight cars and 5x9 inches for heavy cars.

Life of Wooden Poles.

The German Postal and Telegraph Department has recently published statistics collected during a period of 52 years on the life of wooden posts impregnated with different preservative substances, says the Electrical Review of London. The number of posts under observation amounts to nearly 3,000,000, and the following are the average results obtained:

Poles Impregnated with	Length of Life.
Sulphate of copper	11.7 years
Corrosive sublimate	13.7 years
Creosote	20.6 years
Unimpregnated	7.7 years

The manner of preparing the poles has been improved from time to time, and this is clearly shown in a further table giving the average length of life of the poles under different methods of treatment with each preservative at different periods. For example, in 1883, with sulphate of copper the average life was 9.4 years, while in 1903 the method of treatment had been improved so that an average life of 13.3 years could be obtained.

HIGH-TENSION LIGHTNING PROTECTION.*

BY C. R. M'KAY.

The most serious obstacle to the continuous operation of interurban railroads and transmission plants today is the interruption of their high-tension transmission lines and apparatus connected thereto by lightning discharges and disturbances of a similar nature. Interurban railways are naturally more exposed to interruption from lightning than city roads, and since the transmission line links together the entire electrical apparatus of the system, interruptions or damages thereto may, and occasionally do, put the entire road temporarily out of service, and cause heavy loss. Heretofore the protection afforded by any known methods or apparatus has not been wholly satisfactory, either to the operating companies or to the manufacturing companies.

The report of the National Electric Light Association committee on protection from lightning during 1905, which segregates data of high voltage (10,000 and upwards), from low voltage plants, is a long step in the right direction, and furnishes information of a most interesting and practical character. Twenty-nine high-voltage plants reported, aggregating 140,500 kilowatts of capacity. Thirty-eight per cent of those plants aggregating 60 per cent of the total capacity suffered serious damage during 1905. Thirty-five per cent of the total 1,100 miles of transmission line suffered serious interference and but 39 per cent escaped interruption. Forty-five per cent of the companies using choke coils suffered serious damage, an equal portion escaping. Thirty-three per cent of the companies not using choke coils suffered serious damage, 67 per cent escaping.

The figures as to the use of overhead ground wires for protection of pole lines are not very conclusive. In reply to inquiries as to whether their high-tension arresters were satisfactory 35 per cent answered—yes, and 65 per cent answered—no. Of those answering—yes, 78 per cent had suffered no damage. Of those answering—no, 53 per cent had suffered serious damage.

The report shows clearly as to high-tension lightning protection that great improvement is still possible in devices for this purpose. It also indicates that the companies reporting on high-tension plants formed their conclusions more largely from the mere absence or occurrence of trouble than from an actual study of the conditions affecting the success or failure of the protective devices. This is but natural and the cause and remedy therefore will be considered later.

To most of us the word "lightning" means a visible discharge of electricity between clouds or between a cloud and the earth. This impression is incomplete and misleading. Dr. C. P. Steinmetz has defined lightning as being any abnormal voltage condition on a transmission line, whether produced by atmospheric electricity or by internal abnormal surges of electricity. Observation shows that the internal conditions of a circuit may be such as to respond, with a dangerous internal surge, to a light harmless inductive stroke from a cloud. Atmospheric electricity may become manifest either in gradual static accumulations, due to wind, rain, induced charges, or a direct stroke. Static induction may charge the line to an abnormal voltage, whether produced by cloud lightning or by the sudden charging of an adjacent line. Surging or the creation of voltage waves of excessive maximum values may be caused by the opening of a switch on a loaded line, by voltage waves of higher frequency than the impressed voltage, by arcs between the line and isolated conductors, or between one phase and the ground, by short-circuits in transformer or generator coils, or again by the sudden interruption of a short-circuit at the instant of the current wave maximum.

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*Read before the Central Electric Railway Association, Fort Wayne, Ind., Sept. 27, 1906.

The causes producing abnormal voltage effects in transmission circuits develop many different characteristics of discharge. The discharge may vary in frequency from one thousand cycles per second to one billion cycles per second, according to the time element of the circuit traversed by the discharge and which rarely, if ever, twice has the same constants.

Much laboratory experimenting has been carried out, and much has been learned therefrom, but much must also be learned from experience under actual operating conditions, and that experience hitherto has taught but little because it has not been carefully collected, preserved and delivered to those fitted by training and study for the logical deduction of profitable conclusions therefrom.

There is a large field of investigation in which the operating engineer as well as the manufacturer should work. The laboratory cannot include in its equipment leagues of transmission line, thousands of kilowatts of apparatus, dozens of voltages and frequencies, and real lightning storms with a hundred observers for each.

Among the principal high-tension alternating-current protective devices in present use are overhead grounded wires, series resistances and air gaps with and without resistances.

Grounded Wire.

The advisability of installing overhead grounded wires depends largely upon the particular conditions of each individual system. Opinion is much divided as to their effectiveness, but there seems good reason to believe that when properly installed and frequently grounded they do offer a material degree of protection to the pole line itself as distinguished from the apparatus connected to the transmission line. Its use involves high first cost, and its value would be doubtful in protecting a transmission line constructed upon steel supports properly grounded.

Water Streams.

The series resistance arrester in one prominent form consists of grounded streams of water directed against the transmission wires. This type of arrester seems to have little value in protecting apparatus against high frequency disruptive discharges; it is effective, however, in discharging gradual static accumulations. The stream has variable resistance and presents objectionable inductance to high frequency discharges.

Air Gap and Resistance Types.

Both abroad and on the Pacific coast the horn arrester with and without resistance is much used. This type without resistance will maintain an arcing short-circuit lasting several seconds, causing bad line surges and throwing out of step synchronous apparatus connected to the line. When used with series resistance the results are improved, but the use of series resistance offers the serious disadvantage of inability to successfully pass a heavy discharge. Under a light discharge it will generally operate satisfactorily, and by limiting the flow of current will aid in extinguishing the arc across the air gap. Series resistances, furthermore, generally possess considerable impedance, thereby tending to force the discharge across some alternative path with possible resulting damage to apparatus.

The multigap arrester when used without resistance is objectionable in that it offers very little, if any, obstruction to the unlimited passage of current when the arc has been once established across the gaps. The fundamental feature of the present form of multigap arrester is a series of metallic cylinders of less than one inch in diameter placed side by side with spark gaps of about 1/32 inch intervening.

When a shunt resistance is used in conjunction with a series resistance, it is customary to reduce the value of the series resistance and thus detract slightly from the common faults of the multigap series resistance type. For light discharges both the series and shunt resistance will be operative, and for heavy discharges the shunted gaps are automatically cut in. The addition of the shunt resistance does not, as stated above, eliminate entirely the troubles encountered with the plain series resistance. The fact still remains that we have a series resistance, which itself offers considerable opposition to heavy discharges.

In using the shunt resistance without the series the best condition of affairs is approached because all light strokes traverse the shunt resistance, whereas a stroke of large quantity and high frequency will balk at the inductive path afforded by the resistance at high frequency, and will discharge across the shunted gaps. The shunt resistance, if properly adjusted, will extinguish the arc in the shunted gaps and the shunt resistance then acts in series with the series gaps to interrupt the line current. It should be noted that the shunt resistance comes into action only after the lightning stroke is past. Shunting a large percentage of the gaps with just sufficient resistance to prevent excessive current from flowing across the series gaps under ordinary discharges, and to serve as a by-pass for the excessive current accompanying a heavy discharge seems to satisfactorily meet the requirements.

A gradual elimination of arrester types proved ineffective by experience under the excessively severe tests of high-voltage transmission has left but two or three types for serious consideration. The multigap type is most generally favored and nearly all lightning protection for voltages exceeding 600 is effected by devices based upon the multigap principle in combination with resistance. The chief improvement made during the present year in this type of arrester has been the construction and adjustment of the shunt resistance.

In the multiplex arrester a path from line to line is provided with the same number and arrangement of gaps and resistances as from line to ground. Observations made to determine the advantage of the multiplex connection show that frequently the high potential disturbances pass from line to line across the multiplex connection, thus equalizing abnormal strains between lines, without traversing the gaps to ground. In circuits having considerable resonance it is sometimes necessary to increase the number of gaps between line and line to reduce the danger of an arc forming and holding over the line gaps.

The design of the multigap arrester without series resistance fulfills all laboratory requirements, and provides greater security under operating conditions than previous types. It protects from minor static disturbances, as well as being always ready for the severest surge or external stroke, and approaches a practical solution of the lightning and static strain problems which now influence long-distance transmission systems.

Ground Wires.

It is pertinent to refer to the grounding of protective apparatus, although in recent years much improvement has been made in this direction. Its importance is being more generally realized, but there are many plants wherein the weak link in the lightning protection is found between the visible portions of the "ground circuit" and the earth itself.

Wherever possible the ground wire should be straight, and therefore the ground itself should be directly under the lightning arrester. In designing a new power station this condition can generally be made possible and care should be taken to do so. In older stations with grounds already installed at some distance from the arrester it is advisable to make an auxiliary earth connection as nearly beneath the arrester as possible. This is advisable even though the resistance of this auxiliary earth may considerably exceed that of the main earth. The ground wire should be attached to a copper plate having an area of at least four square feet, embedded in charcoal or coke and surrounded by moist earth. The earth surrounding the pit containing the coke can be kept moist by embedding a vertical perforated iron pipe in the coke. The ground wire may run down the side of this iron pipe and the plate may consist of a copper strip about six inches wide and as long as convenient bent lengthwise around the pipe. Either ground wire or plate may be soldered to the iron pipe. Water can both drain and be poured into the perforated pipe and will percolate through the soil and coke, keeping the "ground" perfect under most adverse circumstances.

Data Regarding Performance.

Generally speaking, we lack conclusive data showing the specific values of various high-tension protective devices, the causes of failures, the relative liability to trouble with various voltages, frequencies, topographies and methods of construction. More particularly is our knowledge limited as to what actually occurs, where and when a lightning disturbance takes place. We must thoroughly understand the nature of the disease before we can cure it.

The manufacturer seeking among operators for accurate information on these matters finds it almost impossible to obtain consistent or valuable statements. Different operators utilizing identical protective apparatus under apparently similar conditions give wholly contradictory reports regarding their effectiveness. Companies having the least trouble frequently assume that they have the best protection. No assumption could be less justified. The remedy for this condition lies chiefly in the hands of the operating staffs of the stations and the transmission lines.

It cannot be questioned that the existing lack of practical data covering these matters has been due to the failure of the operating companies to record and preserve it, and this failure is doubtless due largely to a lack of understanding on the part of operators and their employes as to just what information is requisite and valuable. It is hardly conceivable that operators would be so blind to their own interests as to neglect this question, were they fully posted as to the character of information required and the ease of obtaining it. The labor involved in taking and recording the necessary observations is negligible, and technical knowledge is unnecessary. What is wanted are certain facts visible to the operating employes of stations and lines. These men are the ones who see the phenomena at first hand and the men first on the spot after a breakdown, and it is only through the data thereby obtained that a true conception can be obtained of the nature of the discharge and the causes of such failures as occur.

The importance of getting the information immediately at first hand in some suitable shape for future tabulation should be clearly realized. It is desirable and essential to distinguish between the actual observations and the conclusions that may be drawn from these observations; in their relative importance detailed evidence stands first, opinion second.

The universal adoption and use by the members of the Central Electric Railway Association of a suitable information blank covering the nature of each disturbance witnessed would, when answered, compiled and tabulated into a suitable report, provide a vast quantity of data immediately useful in determining the best method of installation and the most suitable device to meet the conditions of any particular system. The use of telltale papers, properly located in the arresters and perhaps operating with a time movement, will be of great value in connection with the other observations, especially in furnishing some record of occurrences taking place in too rapid sequence for the eye and brain to catch and note them. In no other manner can so much valuable information on the subject be so quickly obtained and so effectively utilized. The advantage of the method lies in speedily securing a large amount of practical information with correspondingly quick benefits by the elimination of devices proved ineffective and by materially aiding the improvement of existing devices and the production of new and thoroughly efficient ones.

The class of information which is important to obtain includes details of the following:

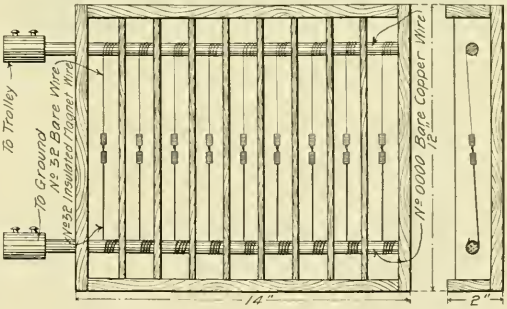
A description of the system covering its general arrangement, its geographical and topographical features; station apparatus, power lines, protective apparatus, character of apparatus protected, character of operating mechanisms, observations of the discharge, location of discharge and accompanying phenomena.

A committee has been appointed by this association for the express purpose of providing the members and their employes with specific information as to the data necessary to make an intelligent report of lightning and similar disturbances, and to provide an information blank for continual use by employes during the coming season in recording occurrences of the kind under consideration. The committee will classify and summarize the reports, placing the resulting data freely before the members of this association and the manufacturers of protective apparatus. The manufacturers will utilize this data toward the improvement of their protective devices.

The success of this movement is wholly dependent upon your individual efforts in executing the committee's program. If you respond as your interests demand, you will promptly reap the benefits, otherwise it cannot reasonably be expected that the manufacturers will without the benefits of your experience produce for you as satisfactory results as you demand and expect of them.

A SIMPLE LIGHTNING ARRESTER FOR USE ON CARS.

A home-made lightning arrester, simple in design and inexpensive, the general arrangement of which is shown in the accompanying illustration, has, for the past two years, been used with satisfactory results on the cars of the Toledo & Indiana Railway Company. Although the territory through which this company's lines operate is at times subject to heavy electrical storms, no arrester troubles due to lightning have been experienced on the cars equipped with these arresters.

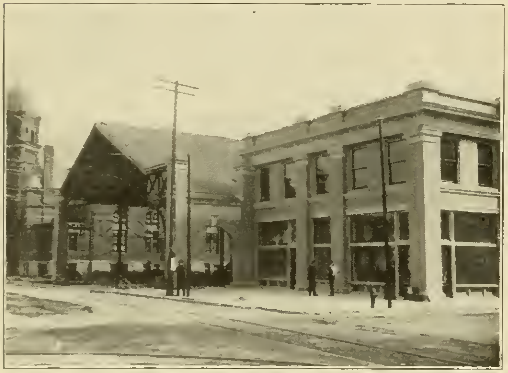


Simple Lightning Arrester Used on Toledo & Indiana Cars.

The essential parts of the arrester are enclosed in a box 2x12x14 inches in size. The interior of this box is divided by partitions into nine compartments of equal size. The two opposite poles of the arrester, one of which is connected with the trolley and the other with the ground, are straight pieces of No. 0000 copper wire which pass through the partitions, at opposite sides of the box. In each of the nine compartments is a so-called fuse, consisting of two pieces of No. 32 copper wire. One of these pieces of wire is insulated and the other is bare. One end of the bare wire is wrapped about the No. 0000 bare copper positive pole and the other end is joined with one end of the insulated wire by an ordinary "Western Union" joint, but the insulation is not removed before making the splice. The opposite end of the insulated wire is wound around the negative pole of the arrester without having its insulation disturbed. By this arrangement of wires and the insulated-noninsulated joints, of which there are nine in the arrester, a sufficient resistance is afforded to withstand a normal pressure of 1,800 volts, but should the set of fuses be subjected to a higher voltage or to lightning the increased potential will puncture the insulation and allow the excessive charge to pass to the ground. These boxes are installed in a vertical position with the positive conductor above and are inspected several times each day.

NEW INTERURBAN STATION AT MUNCIE, IND.

The interurban station which the Indiana Union Traction Company has built at Muncie, Ind., in general arrangement follows the design of the Traction & Terminal station at Indianapolis, and comprises three parts, the station building for passengers, the freight station, and the trainshed. The site, a half block, is bounded on the north by Charles street, on the west by Mulberry street and on the south by Howard street, the dimensions inside the building lines being 215 by 125 feet.



Indiana Union Traction Company—Front View of Trainshed and Office Building, Muncie Terminal.

The passenger station building is of fireproof construction (Roebling system), 50 by 100 feet, set 18 feet back from the north building line. This portion is two stories with basement, but the foundations and superstructure have been designed for a six-story building, so that four stories may be added when desired. The building is a very handsome structure, being of Columbus gray speckled pressed brick, with Bedford stone trimmings. The interior finish is of birch stained to mahogany color, and the floors are of beech, this wood being preferred to maple because not so easily discolored.

The freight house is 25 by 97 feet and is directly in the rear of the passenger station; this building is of slow-burning construction, the exterior walls being of Columbus gray speckled pressed brick. On the east side is a platform 8 feet wide. Openings, 8 feet wide, are provided in both side walls and at the south end; on the west side these are spaced to conform to the cars which have two side doors, and on the east side are spaced for cars having a single door in the center. All the large openings are closed by rolling steel doors manufactured by the James G. Wilson Manufacturing Company, of New York.

The trainshed is 64 feet wide by 136 feet long, supported on built-up columns spanned by eight steel trusses. The bays are 18 feet 3 inches between centers, excepting the middle ones, which are 24 feet apart. The centers of the lower chords of the trusses are 26 feet above grade and the ridge 41 feet. The end truss on the Charles street front is supported on the station side by a steel cantilever, this arrangement being adopted to avoid the use of a column and to permit greater clearance between the west track and the station structure.

Indiana Union Traction Company—Interior of Waiting Room, Muncie Terminal.

Between the west columns supporting the trainshed and the station building is a passage 12 feet wide, which is roofed over at the level of the second floor. Should growth of traffic require larger waiting rooms for passengers the necessary space can be provided by enclosing the east side of this 12-foot passage with glass.

The roof of the passenger station is of asphalt and the roofs of the freight house and trainshed are of red National interlocking tile.

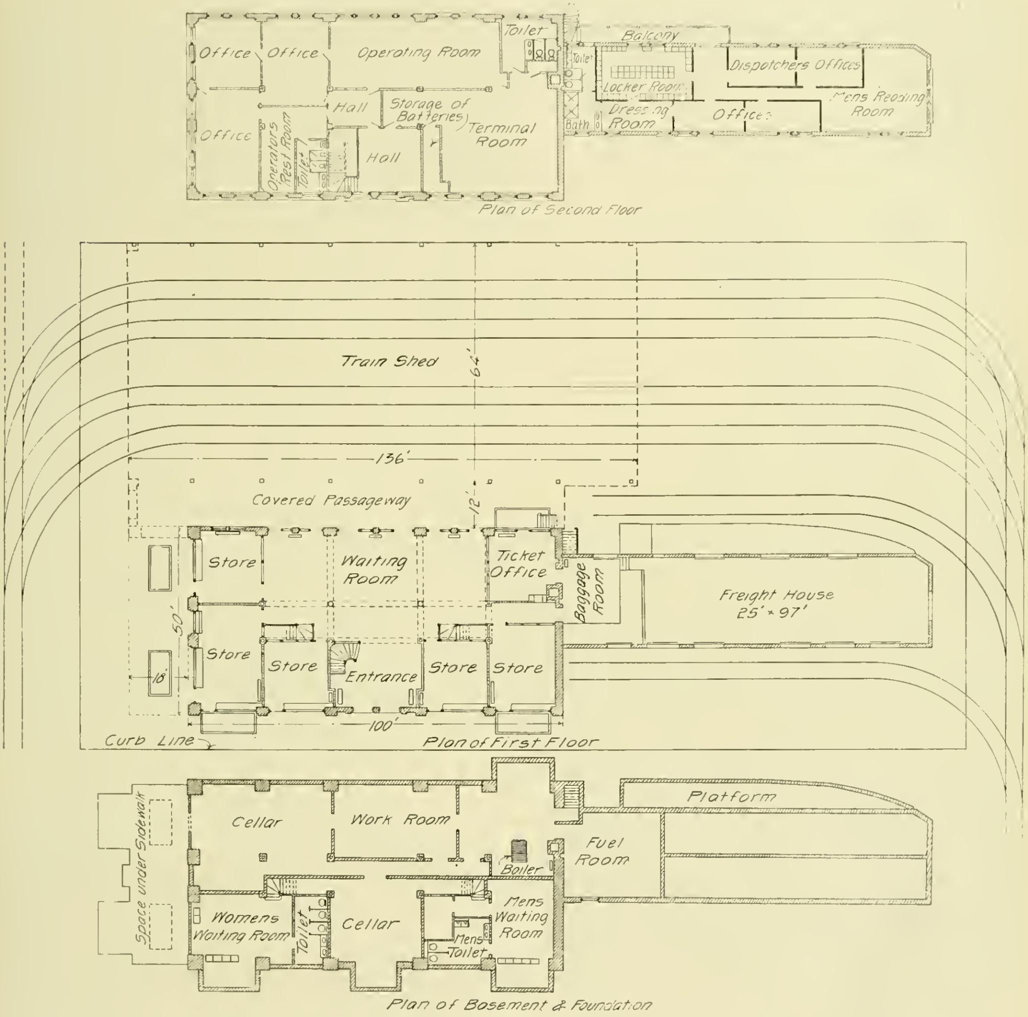
At the east side of the trainshed there will probably be built a brick wall 7 feet or so in height, and should the freight platforms now built be insufficient for the traffic it will be practicable to build another platform along this wall to which wagons could secure access from the alley bounding the property on the east. Reference to the plan shows the arrangement of the four tracks which loop through the trainshed and the two spur tracks which give access to the freight house.

Indiana Union Traction Company—View of Freight Shed, Muncie Terminal.

The main floor of the passenger station building has five storerooms on the north and west sides, through all of which there is access to the waiting room proper. At the south end of the waiting room is the ticket office. In the basement at the south end is located the boiler room for supplying steam heat to the building and also the toilet and retiring rooms; access to the men's and women's rooms is by separate stairways. The entire second floor of the building has been leased to the Central Union Telephone Company for its Muncie exchange and office purposes.

The freight house is two stories in height. At the west end of the first floor is a room for the handling of baggage, the rest of this floor being for freight. The second floor is arranged for the offices of the train dispatcher, the local superintendent and rooms for the trainmen, which includes space for lockers, shower baths, etc.

The architect for the building was Mr. Alfred Grindle, of Muncie, Ind., and the general contract was let to J. B. Snyder, of Muncie. The Indiana Bridge Company was subcontractor for the structural steel work in the trainshed.



Indiana Union Traction Company—Floor Plans of Muncie Terminal Station.

BRAKES AND BRAKING.*

BY G. C. GRAHAM, SUPERINTENDENT OF CAR EQUIPMENT, INTERNATIONAL RAILWAY COMPANY, BUFFALO, N. Y.

The questions of what is the proper system of brakes to use and how to apply them on the heavy four-motor cars that are being built today for both city and interurban service, and principally operated as single cars, are of great importance and are worthy of the attention of all street railway companies.

During the evolution of the street car brake, as in the case of nearly every mechanical appliance, much has been learned respecting its operation, and the strong and weak points gradually discovered. Practice would seem to demonstrate that up to this time no system of braking has yet been devised which can properly be compared with straight air for cars operated through city streets.

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* Read before the Street Railway Association of the State of New York, Albany, N. Y., September 19, 1906.

This system gives the motorman a quick, safe and easy control of the car without any exertion on his part, and his preference for this system can easily be seen where hand, electric and air brake cars are operated over the same lines. I have known motormen who would invariably turn in a car fitted with either a hand or an electric brake, reporting some imaginary trouble, if he thought there was any possibility of getting a car equipped with airbrakes to replace it. Where the lighter cars equipped with hand brakes are operated over the same line as cars equipped with airbrakes, it is absolutely necessary that the hand brakes be kept in the best possible condition, to allow motorman to make his stops properly without much labor on his part, and still keep out of the way of cars which are being operated with airbrakes. In this we are greatly assisted by the use of the gear drum or eccentric-wind brake staff, which not only makes it easier for the motorman, but is quicker and safer than the old method of bolting the chain through the bottom of staff, which was the practice some few years ago.

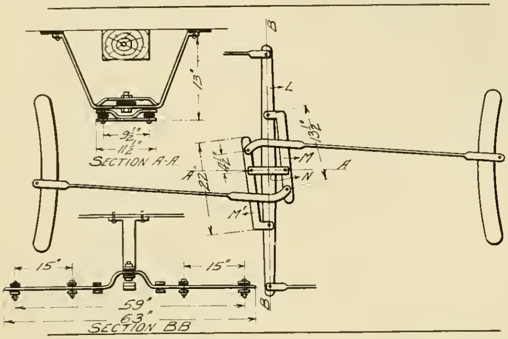


Figure 1—Brakes and Braking—Equalizing Brake in Use with Brill M. T. Truck.

At present we are operating over the different lines of the International Railway Company, in the city of Buffalo, cars some of which are equipped with hand, some with hand and electric, and some with hand and straight air brakes. On cars equipped with both electric and hand brakes the electric brake is used exclusively; on cars equipped with air and hand brakes the airbrake is used exclusively, except between the hours of 10:00 and 11:00 a. m., during which time the motormen have orders to operate hand brakes. This not only gives the motorman an opportunity to ascertain the condition of these brakes and report thereon, but also keeps the staffs and gears from rusting and clogging up with dirt, preventing them from getting into a condition such that they cannot be set up and released properly. The high-speed cars in interurban service have designated stops to make daily with the hand brake.

Our largest car operated with the aid of hand brakes only is 34 feet long, weighing approximately 11 tons, with a seating capacity of 34 persons. These cars were originally equipped with double chains with ⅜-inch links, connecting ¾-inch brake rods, and attached to the brake lever through reinforced ends by ¾-inch key bolts. The chains wound on the sprocket on the brake staff would, at times, on some of our lines, clog up with ice during the winter months, making it impossible to set the brakes, or when set, very difficult to release them without getting off the car. To overcome this trouble we have discarded one chain on this type of wind on these cars; the results of this have been very gratifying, and we have never known of an accident due to the breaking of a brake chain. This brake rigging is giving good satisfaction, but on account of maximum traction trucks being used under these cars, there are times when the brakes are set up that the wheels of the rear truck will slide somewhat, not only causing numerous flat wheels but also rendering the cars rather difficult to control; however, this is mostly eliminated by an equalizing device, installed by a former employe, which has proven very efficient.

(Referring to Figure 1, the lever L is pivoted at the center to a bracket bolted to the car body, and the brakes being set, any longitudinal motion of the car body relative to the trucks will affect the distribution of braking stresses as between the two trucks, were the brake rods attached directly to L. By introducing the equalizing levers M and M' connected by the link N, a movement of the fulcrum of lever L does not affect the rod stresses.)

This device not only does away with flat wheels, but also facilitates control of the car by ensuring the working of brakes simultaneously on both trucks at all times. We have several cars equipped with this equalizer, which have been in service over four years, and we have yet to find a flat wheel on any of them.

The cars equipped with electric brakes are 39 feet overall, weigh about 14 tons, and have seating capacity for 40 persons. This type of brake we have always found reliable in stopping the car, but it is the cause of more motor trouble than is found with similar equipment operated with airbrakes. It has also been the cause of many protests from the patrons of the road, due to the disagreeable jerking of the car when making an ordinary service stop. This trouble has been considerably lessened by changing from ribbon to grid-iron rheostats; with these rheostats better results have been secured and only half the number are required. These cars are operated over several 4 per cent grades and the hand brakes are in use continuously in stopping and holding cars while operating thereover.

The city cars equipped with airbrakes vary in weight from 13 tons to 25 tons, and range in length from 36 feet to 45 feet, having seating capacities for 30, 40 and 44 passengers. The hand brakes on these cars are attached to a gear drum with an eccentric wind at the brake staff, using a single flat chain with 7/16-inch link. The rods running back to the floating lever, which is independent of the air brake, are ¾-inch; at the bends necessary to avoid the motors, the size is changed from ¾-inch round to 1½x½-inch flat. These rods are connected to the lever by ¾-inch key bolts. The 13-ton cars are braked with air at from 45 to 55 pounds, and the 18-ton cars which at times are operated with trailers, at from 50 to 65 pounds of air.

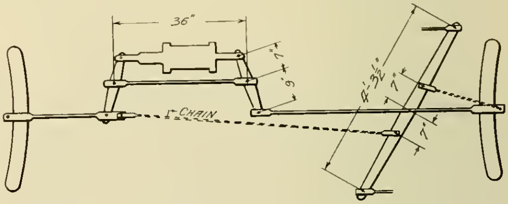


Figure 2—Brakes and Braking—Air and Hand Brake on 13-Ton Car.

Figure 2 shows the method of connecting the air and hand braking levers on 13-ton cars. Use of the airbrake does not cause any movement of the hand brake lever or rods; the chains merely are slackened.

Our interurban high-speed cars are 44 feet over all, weighing approximately 27 tons, having a seating capacity for 48 persons. These cars are run at a speed of 50 miles per hour and make a great many stops. When some of the older type trucks were put in service we experienced more or less trouble on account of the breaking of brake rods where they go through the brake beam, due to the pull not being in a direct line; and this was also found to be partly the cause of the shoes not wearing true on the wheels. It was found that by removing the adjusting bolts on release springs, running the springs through slots in brake head, upsetting the clip that fastens brake rods to brake beam, and bolting the clip on the underside, giving the rod a straight pull and allowing the brake shoes to bear true on the face of the wheels, the trouble from this source could be eliminated altogether. The working of the hand brakes on these cars is practically the same as on the heavy city cars, but on account of being operated in three-car trains during the heavy travel, should there be necessity of additional braking, in case of air giving out, the motorman can, by a signal from his whistle, notify the conductor to set up hand brakes on all rear cars. The air compressor on these cars cuts in at 55 pounds and out at 70 pounds, being controlled by a train line governor with an equalizer circuit connecting the governors on all the cars in a train. During the three years that these cars have been in operation we have never experiencd any difficulties other than that mentioned. Close inspection, of course, must be given to hose connections, key bolts in brake lever, and minor parts. On cars equipped with multiple control, the air-hose couplings, owing to their high position on vestibule front to allow cars to pass curves, have considerable wear close to the elbow, and, if not watched closely, are liable to burst. The key bolts show more evidence of wear than any other part of the brake rigging, and often, when the bolt is apparently in good condition, it is found, upon examination, to be almost sheared into three pieces.

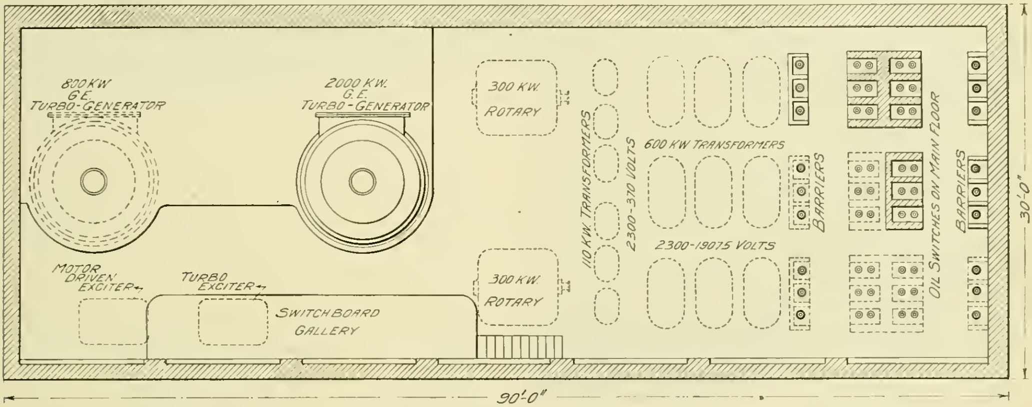
Great benefit is derived from the practice of sparing no time or trouble in instructing motormen regarding the proper use of all brakes. By adherence to this method the life of equipment is materially lengthened, and the traveling public is afforded smooth and pleasant riding.

There is a bad practice prevalent among new motormen, in which they seem to delight—one which, however, cannot be discouraged too quickly—and that is, the habit of causing airbrakes to exhaust constantly. While making an ordinary service stop these men will manipulate the air handle from the emergency position to the release, thus keeping the air compressor constantly in operation.

Another point which should be firmly impressed upon the motormen is the manner of making an emergency stop by throwing the controller into the reverse position in the event of the operating brakes giving out. It has been found that motormen thoroughly familiar with their duties experience little trouble in retaining control of their car by either the air or hand brakes, or reverse lever, should one or the other fail to operate from any cause.

NEW POWER EQUIPMENT OF THE COLUMBUS DELAWARE & MARION RAILWAY.

The Columbus Delaware & Marion Railway Company operates an interurban electric line from Columbus, Ohio, north to Marion and also the local street railway lines in Delaware and in Marion. The company has an interurban mileage of 49.84 miles, and in Delaware there are 4.56 miles and in Marion 4.28 miles of local lines. The interurban cars enter Columbus over the lines of the Central Market Street Railway Company, which is now owned by the Schoepf interests, but is operated by the Columbus Railway & Light Company for the owners. The round trip from the city limits down over the loop which passes the interurban station in Columbus and back to the city limits is 10.34 miles, to make which requires 25 minutes.



New Power Equipment, Columbus Delaware & Marion Railway Company—Floor Plan of Power House.

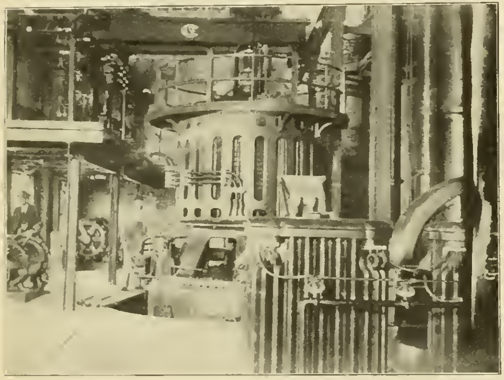
When the road began operating in 1902 a power plant had been built at Stratford, about 5 miles south of Delaware. This plant was equipped with one 400-kilowatt General Electric 550-volt generator, belted to a 14 and 23 by 22-inch McIntosh & Seymour condensing engine and a similar 400-kilowatt generator, direct connected to a 26 by 32-inch Porter-Allen engine, operated non-condensing, and three 250-horsepower Heine water-tube boilers, generating steam at 130 pounds, each fitted with a separate steel stack. As this equipment was not sufficient to supply current for the operation of the entire line a power plant at Marion was used to help out on the north end, and current was secured from the Columbus Railway & Light Company for the south end of the line.

Early in 1905 the company determined to replace the insufficient equipment at Stratford with a modern, high-tension generating station of sufficient capacity to supply the entire line, and a 2,000-kilowatt Curtis turbine unit, four Heine boilers, two of 266-horsepower each and two of 267-horsepower each were installed, the turbine unit being put in operation in November last. An 800-kilowatt Curtis turbine unit is now being installed, and when this is in place the boilers will be removed from the old location and installed in what was the engine and generator room of the old station.

The new generating apparatus is installed in a new building, which is of limestone, with roof of concrete. After the rearrangement of the boilers is completed the new generator room may be extended lengthwise to accommodate such apparatus as may be needed in the future.

At this time the generator room is the only portion of the station which is completed. This is a building 90 feet long by 36 feet wide and is to be extended at the generator end as demands for increased capacity may require.

The general arrangement of the apparatus is shown in the accompanying plan. As stated the 2,000-kilowatt turbo-alternator is the only piece of generating apparatus now in place, but the foundation for the 800-kilowatt unit is in place. At this end of the building the floor extends along one side only of the generators, as the condensers, which are of the Buckley type, will be installed at the rear of the turbines. There are two exciter units. One is a 75-horsepower General Electric induction motor, operated at 2,300 volts, 25 cycles, three-phase, direct connected to a 125-volt, six-pole direct-current generator; this motor-generator set operates at 750 revolutions per minute. The other exciter consists of a Curtis turbine direct connected to a 200-ampere 125-volt direct-current generator; this operates at 3,600 revolutions per minute. The two exciter units are located on the first floor in front of the generators just below the switchboard gallery.


New Power Equipment, Columbus Delaware & Marion Railway Company—Turbine Unit with Auxiliaries.

Near the center of the room are the two 300-kilowatt rotary converters which supply the direct-current feeders from the main station. Next to these converters are two sets of 110-kilowatt transformers, three for each rotary, which transform down from 2,300 volts, which is the generating potential, to 370 volts for the rotaries. Back of the low-potential transformers is a set of three 600-kilowatt oil-insulated, water-cooled General Electric step-up transformers for raising the voltage from 2,300 volts to 19,075, which is the potential for the alternating-current feeders. Provision is made for three sets of such step-up transformers, but one set only is installed at this time.

The high-tension leads from these transformers are carried down to the basement, where the bus compartments are located. The outgoing alternating-current lines tap the buses on the opposite side from the transformer leads and are carried through the floor and up the end wall of the building, choke coils and lightning arresters being mounted on this wall. The oil switches controlling these circuits are located on the main floor immediately above the corresponding sections in the bus structure below. In the plan view the barriers indicated by the dotted lines are those for the two transformer sets and the third high-tension feeder lines which are not yet installed.

The switchboard, which is located in the gallery in front of the generators and 9 feet above the main floor, is for the control of the 2,300-volt circuits and the direct-current feeders. There are provided switchboard panels as follows: One for station lighting, one panel for the turbine-driven exciter, one for the motor-driven exciter unit; space is left for two panels, then come one panel for the motor driving the exciter and two panels for the main generators; space is left for an additional panel and then are two high-tension feeder panels and two panels for the alternating-current end of the rotaries. The direct-current switchboard is a continuation of the other board and comprises two panels for the rotaries and three panels for feeders. An oil switch is provided for the 2,300-volt busbar.

The station is served by a 30-ton hand-operated Case crane of 21 feet 8 inches in span; two trolley hoists of 15 tons capacity each are provided.

The water supply for this station is drawn from the Olentangy river, which is within about 100 feet of the station. Four suction lines are laid to the river, one 20 inches in diameter for circulating the water for the condensers, one 8 inches in diameter which supplied condensing water for one of the units in the old station, one 4-inch line for an emergency boiler feed supply and one 2-inch line supplying a filter from which is drawn the water for the step-bearings of the turbines.

The circulating pump for the condenser is of the Buckley duplex type 14 and 24 by 24 inches and is placed in the basement at the side of the turbine foundation. In the basement are also located pumps supplying water for the cooling transformers and supplying the suction for the step-bearing pumps. There are two step-bearing pumps operating against 400 pounds suction. The pumps for the force feed lubricating system are also in the basement.

There are on the system four substations located at Chaseland, 14 miles south of Stratford; at Stratford, in the power station; at Prospect, 15 miles north of Stratford, and at Marion, 30 miles north of Stratford. At Chaseland are two 300-kilowatt General Electric transformers and three 220-kilowatt air-blast transformers; at Prospect there are one 300-kilowatt rotary and two 220-kilowatt air-blast transformers connected in open delta; (when a second rotary is needed here a third transformer will be installed and the delta completed). At Marion the substation, which is now under construction, will have two 300-kilowatt rotaries, six 220-volt transformers and two 200-kilowatt motor-generators used for changing the frequency from 25 cycles to 60 cycles for supplying and lighting circuits.

At present, pending the completion of the substation at Marion, a portable substation plant consisting of a 300-kilowatt and two 220-kilowatt air-blast transformers is cut into the line at Christian, four miles south of Marion. After the Marion station is completed the portable station will be available for emergency use wherever it is desired to increase the substation capacity temporarily. A short time ago an accident caused the shutdown of the lighting station in Marion. This emergency was met by installing a 200-kilowatt motor generator for use as a frequency changer in a box car and taking this down to the portable equipment at Christian, where the frequency of the 25-cycle circuit is changed to 60 cycles and supplied to the light circuits in Marion.

The power equipment of the Columbus Delaware & Marion Railway is in charge of Mr. C. F. Turner, chief engineer, to whom we are indebted for the accompanying illustrations.

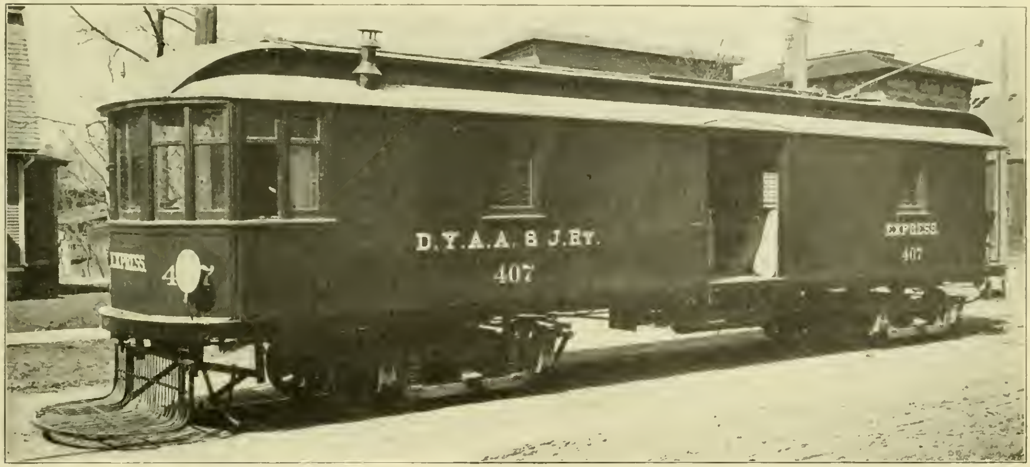
The Telegraphone.

A series of interesting tests of the telegraphone was recently made in the vicinity of Winnipeg, Man., with entire success. The advantage of this instrument is that it makes it possible to use a dispatcher's wire, which is in constant use in the carriage of telegraph messages, for telephone purposes at the same time.

CAR BUILDING IN THE SHOPS OF THE DETROIT YPSILANTI ANN ARBOR & JACKSON RAILWAY.

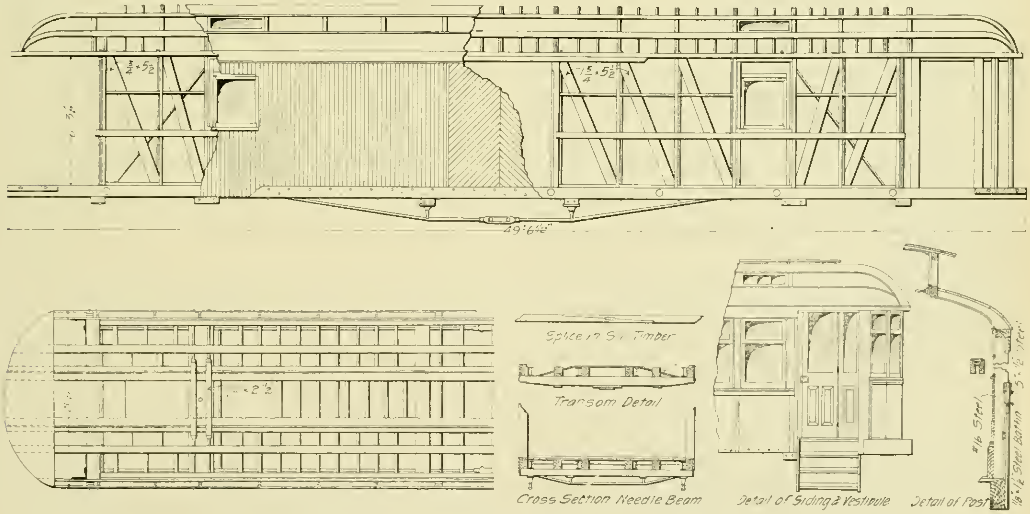
The repair shop forces of the Detroit Ypsilanti Ann Arbor & Jackson Railway at Ypsilanti, Mich., are at present engaged in car construction and rebuilding work of an interesting nature. The work includes the splicing of combination baggage and passenger cars and strengthening their framing for use as express cars, reinforcing the framework of 50-foot passenger cars, increasing the length of 45-foot passenger cars to 53 feet, and building an 18-ton electric locomotive for general use.

The accompanying photograph of car No. 407 represents one of three cars that, when new, were of the ordinary combination baggage and passenger car type. Each had an original total length of 45 feet 3 inches which, in reconstructing, has been increased to the present total length of 49 feet 6½ inches. The details of the side and floor framing as rebuilt are shown in the accompanying illustration. It will be noted that the substructure of the car has been reinforced by four five-inch steel I-beams weighing 14.75 pounds per lineal foot. The cross-section view of a needle beam shows the arrangement of these reinforcing steel beams.



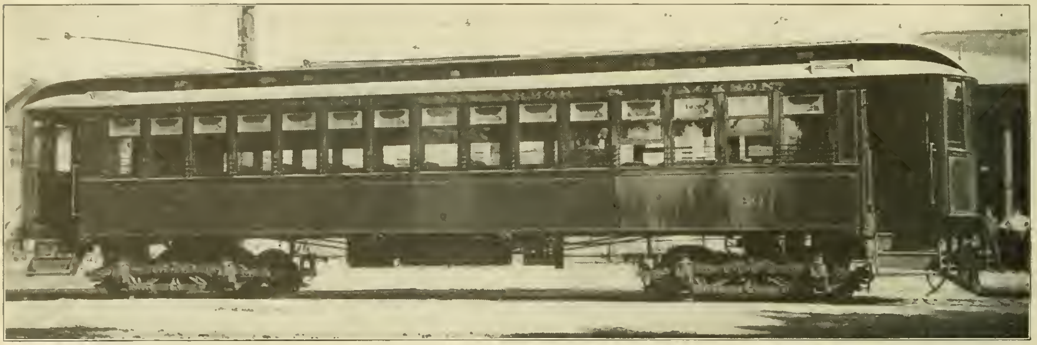
Car Building at Ypsilanti, Mich.—Express Car 49 Feet 6 Inches Long Constructed from Combination Car 45 Feet 3 Inches Long.

The frame plan and details of car No. 17 illustrate a different class of work; six cars of this type, 49 feet 6½ inches long, are having their sills reinforced and general changes made in the windows and siding. In rebuilding the length of these cars is not changed. The work includes the placing of four truss-rods on each end reaching nearly to the center of the car, so that the sills supporting the vestibules are substantially reinforced. Also changes are being made in the d



Car Building at Ypsilanti, Mich.—Floor Structure and Framing of Express Car No. 407 as Rebuilt and Details of Posts and Siding of Car 17 as Rebuilt.

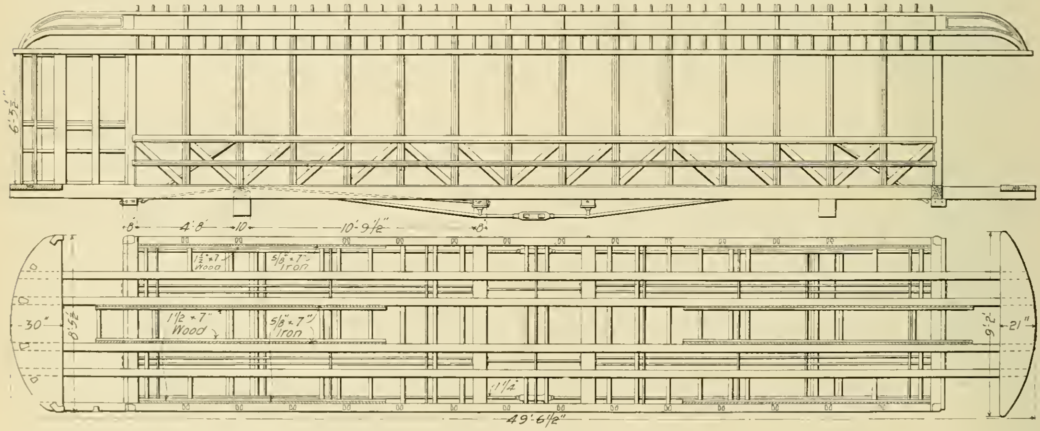
tails of the posts and siding so that the windows which were originally built to lower into the side now are raised when opened. This change necessitated new posts, the details of which are illustrated. This type of car and some of the others which are being rebuilt are sheeted with No. 16-gauge, leveled and resquared sheet steel cut into panels the size of the windows. This sheeting is screwed to the outside of wood sheeting placed diagonally on the posts. The cars so enclosed have maintained a better appearance with the same amount of painting and service than have those with matched wood sides.



Car Building at Ypsilanti, Mich.—Passenger Car 53 feet Long Constructed from Car 44 feet 5 inches Long.

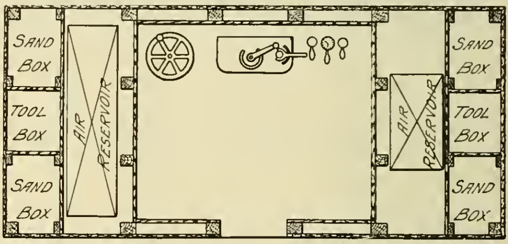
A departure from the regular practice of vestibule building has been made by constructing all vestibule windows so that they raise, with the exception of the front center one, which is stationary, and one on the left side which drops. It is thus possible to build a stronger front end and the repair troubles are lessened.

One of the half-tone illustrations shows passenger car No. 30, which represents one of five old 44-foot 5-inch passenger cars that are now too small for the traffic and are being converted into 53-foot cars to match the other "limited" cars of the road. The sills of these cars are being reinforced with four five-inch I-beams, new posts are being made and the windows changed from the drop to the raise type. The interior finish is of quarter-sawed oak and the back platforms are full vestibuled. These cars are equipped with electric heaters, Heywood Brothers & Wakefield No. 55 A. G. F. red plush, high-back seats and four Westinghouse No. 112 motors installed for single-end operation with an L-4 controller.



Car Building at Ypsilanti, Mich.—Side and Floor Framing of Passenger Car 17 as Rebuilt.

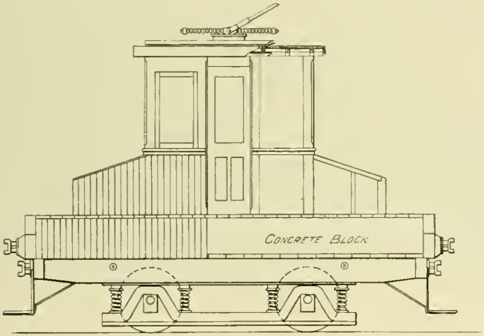
The original four-motor equipments on the line consisted of Westinghouse Nos. 76 and 38-B motors. In the reconstruction work No. 93-A and No. 112 motors have been substituted for the 38-B type. The rotary air compressors are also being discarded for new Westinghouse pumps and operating valves.



Floor Plan of 18-Ton Electric Locomotive.

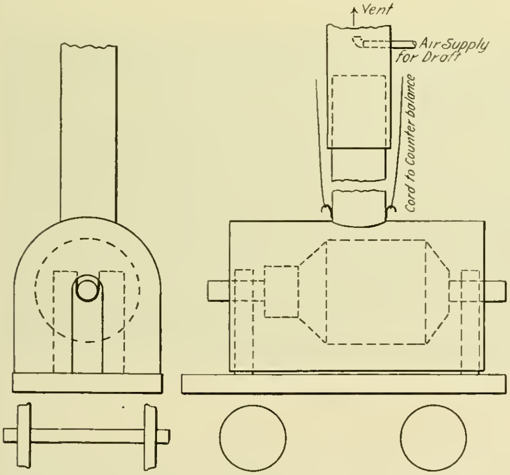
One of the line drawings represents an 18-ton electric locomotive which is now being constructed in the Ypsilanti shops. This locomotive will be used for hauling cars from the connecting steam roads and for general switching purposes. The motor equipment consists of two 38-B motors with a 14-68 gear ratio and a K-14 controller placed as shown in the floor plan. An air pump and a large air reservoir are provided. The available tractive effort will be increased over that for the ordinary locomotives of this size by filling with concrete the 18-inch by 16-foot body directly above the sills. Wherever any rods or other parts pass through this concrete they are encased in iron pipes bedded in the concrete.

The construction and repair shops of the Detroit Ypsilanti Ann Arbor & Jackson Railway are in charge of Mr. C. M. Bange as master mechanic. The present shop space is limited and plans are under consideration for the construction of an addition, 36x128 feet, to be built early next year.



Car Building at Ypsilanti, Mich.—18-Ton Electric Locomotive Under Construction.

DUST CONVEYOR FOR ARMATURE CLEANING.

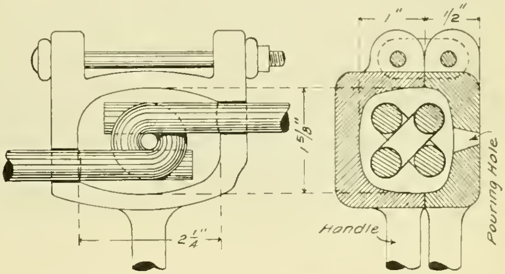


Dust Conveyor Used in Armature Cleaning—Side and End Elevations Showing Armature on Truck Covered by a Hood.

The accompanying sketch illustrates the device used by the Indianapolis Traction & Terminal Company when cleaning armatures, which was designed in order to carry the dust out of the building instead of dispersing it about the shop. The armatures are transported about the shops on trucks and the hood shown, which is of galvanized iron, 18x30 inches, fits down over the armature as it rests on the truck. At the top of the hood is a pipe which moves vertically in a pipe leading to the roof and, being counterbalanced with weights, the hood may be moved up or down as desired. A small air pipe is carried into the exhaust from the hood and turned upward, so that a draft is induced. The air pipe for blowing out the armature is introduced below the hood, or if it is desired to reach the armature from the side small shuttered openings are provided.

MOLD FOR SOLDERING LARGE JOINTS.

The mold for casting solder about joints in bond connections herewith illustrated was designed by Mr. Thomas McMath, engineer of the Indianapolis Traction & Terminal Company, for use by sectionmen. It is no longer used by this company because the track-bonding repair work is now done by the overhead department, which has at command more highly skilled labor than was available for the track department when this device was designed. The mold is in two sections, each having a handle 6 inches long on one side and fastened together at the other by links, and is intended to receive two sections of No. 0000 wire hooked together. The hole for pouring the solder is in the upper section and is countersunk from the underside to give draft.



Mold for Soldering Joints in Bond Connections.

DIRECTORY OF ELECTRIC RAILWAY ASSOCIATIONS.

American Street and Interurban Railway Association. Secretary, Bernard V. Swenson, 60 Wall street, New York. Annual meeting, Columbus, O., October 15-19.

American Street and Interurban Railway Accountants' Association. Secretary, Elmer M. White, assistant treasurer Birmingham Railway Light & Power Company, Birmingham, Ala. Annual meeting, Columbus, O., October 15-19.

American Street and Interurban Railway Engineering Association. Secretary, S. Walter Mower, general manager Southwestern Traction Company, London, Ont. Annual meeting, Columbus, O., October 15-19.

American Street and Interurban Railway Claim Agents' Association. Secretary, B. B. Davis, claim agent Columbus Railway & Light Company, Columbus, O. Annual meeting, Columbus, O., October 15-19.

American Street and Interurban Railway Manufacturers' Association. Secretary, George B. Keegan, 2321 Park Row building, New York, N. Y. Annual meeting, Columbus, O., October 15-19.

Canadian Street Railway Association. Secretary, Allan H. Royce, vice-president Toronto Suburban Railway, Toronto, Ont.

Central Electric Railway Association. Secretary, John H. Merrill, Traction Terminal building, Indianapolis, Ind. Meetings held every two months, except during the summer, on the fourth Thursday of the month.

Colorado Electric Light Power & Railway Association. Secretary, John F. Dostal, Denver Gas & Electric Company, Denver, Colo.

Iowa Street and Interurban Railway Association. Secretary, L. D. Mathes, general manager Union Electric Company, Dubuque, Ia. Next meeting, Clinton, Ia., May, 1907.

Massachusetts Street Railway Association. Secretary, Charles S. Clark, 70 Kilby street, Boston, Mass. Meetings held in Boston on second Wednesday of each month, except July and August.

Northwestern Electrical Association. Secretary, B. Adams, Madison, Wis.

New England Street Railway Club. Secretary, John J. Lane, 12 Pearl street, Boston, Mass. Meetings held on fourth Thursday of every month.

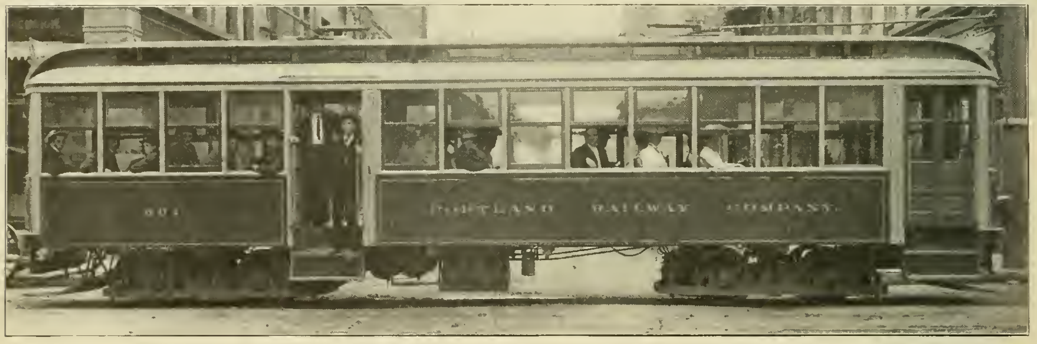
Pennsylvania Street Railway Association. Secretary, Charles H. Smith, superintendent Lebanon Valley Street Railway, Lebanon, Pa.

Southwestern Electrical & Gas Association. Secretary, C. B. Meginnis, manager Dallas Gas Company, Dallas, Tex.

Street Railway Association of the State of New York. Secretary, C. B. Fairchild, Jr., 114 Liberty street, New York. Quarterly meetings.

SIDE ENTRANCE CARS BUILT BY THE PORTLAND RAILWAY COMPANY.

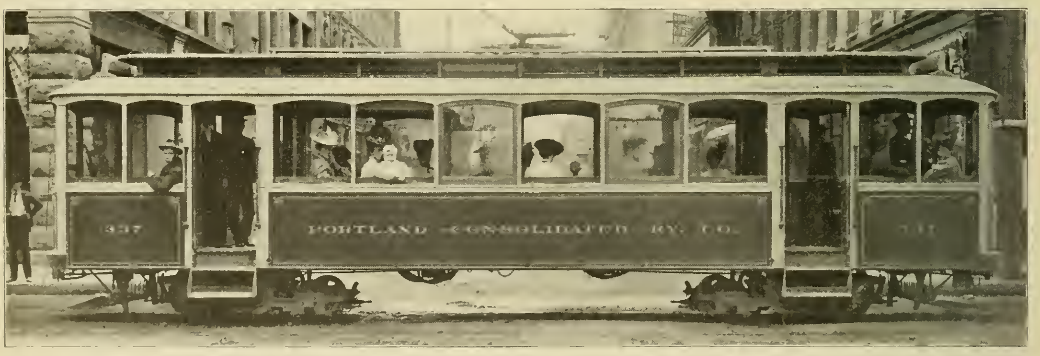
The Portland Railway Company of Portland, Ore., has for several years been building practically all of its own cars and trucks, and during the year 1905 the road increased its equipment very materially to provide for traffic incident to the Lewis and Clark exposition. On this account it has been necessary to do but little car building during the present year, though four 45-foot suburban motor cars, two 50-foot trailers and several freight cars have been turned out. Twelve 38-foot motor cars for city service are now under construction in the company's shops.



Portland Railway Company—Side-Entrance Car with Two Compartments.

The four 45-foot suburban cars recently completed are equipped with trucks of the company's manufacture fitted with Christensen airbrakes, and four G. E. 58 motors each. These cars are of a special type which experience has shown to be especially adapted to the company's needs. They have an ordinary full-vestibuled platform about five feet in length, followed by the car body, about 24 feet in length, with cross seats; there is then a rear portion 16 feet in length with longitudinal seats. The rear portion, which is enclosed with windows and fitted with controller and brake, so that the car can be run from the rear end in case of emergency, has an entrance directly back of the closed body of the car.

This type of car is used on loop lines and is usually run with the small platform ahead. It has been found a very acceptable car for the Oregon climate. The location of the entrance, nearly 16 feet from the rear end, makes it possible to load and unload the car very quickly, and the large rear portion with longitudinal seats provides a large amount of standing room which can be occupied by smokers and others, who do not care to crowd into the forward compartment. The cars are finished in ash. They have two straight eight-inch I-beams running from one end of the car to the other.



Portland Railway Company—Three-Compartment Car with Two Side Entrances

The twelve 38-foot cars which are under construction for city service are also of a special type. The central body is about 21 feet long, with longitudinal seats. At each end of this portion of the car are what may be termed long vestibules, that is, a portion of the car 8 feet 6 inches long provided with steps close to the body of the car. This arrangement furnishes room on each side of the car at both ends, between the door and the end of the car, for a longitudinal seat capable of seating four or five persons. Both ends of the car are fitted with controllers, sanders, fender trips, gongs, etc. The usual station for the motorman is, of course, at the end from which the car is being operated, while the conductor usually stands at the rear end of the body of the car opposite the steps. The vestibules have windows all around them, which raise and lower in the same manner as in the body of the car. The location of the two pairs of steps about 21 feet apart in the 38-foot length of the car facilitates rapid loading and unloading of passengers. These cars are also equipped with trucks of the company's manufacture and are provided with two G. E. 58 motors to each car. The motors are outside hung. Some of the cars are finished in oak, others in quarter-sawed oak and ash.

The Rockford Beloit & Janesville Railroad, Beloit, Wis., has granted an increase of one cent an hour in the wages of its motormen and conductors who have been in the company's service for six months.

PIPING & POWER STATION SYSTEMS.—XXII.

BY W. L. MORRIS, M. E.

A satisfactory substitute for this temporary cleaning device as designed by the writer, is shown in Figure 213-(E4-2). This device, which has the form of a truck, is constructed with its upper portion of wood in the shape of a shallow box with two 2x8-inch side stringers. The top lid, a, when closed rests on top of the box. This top is hinged at b, and is supported on the boiler fronts by the U-shaped straps, c, into which the hinge-bars fit. This locking to the front of the boiler is quite necessary in order to prevent the truck being shoved away from the setting while the men are at work. The cover, d, closes up the top of the box, thus making a solid and smooth platform for the men to stand upon. The wheels are broad-faced cast iron and those marked e are castors which can be rotated with the handle, f, loose-jointed at g. The cross pipes, h, serve as braces and steps.

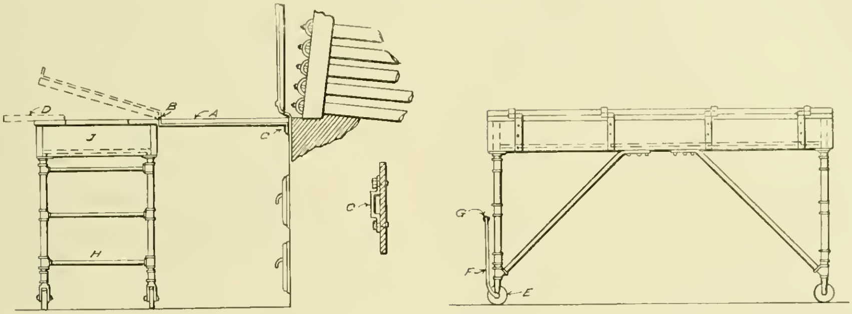


Figure 213—(E4-2).

This entire platform can be kept painted and does not disfigure the boiler-room. The box, i, may be used for storing the cleaning tools and also for laying aside crabs, plates and gaskets, which are taken from the boiler during cleaning. The cover, d, closes the box while the turbine cleaner is in use. Such a truck can be made at a moderate cost by a blacksmith, carpenter and pipefitter. If it is profitable to construct permanent metal platforms for cleaning the vertical type of water-tube boilers, would it not seem equally profitable to supply plants having horizontal water-tube boilers with devices for similar work.

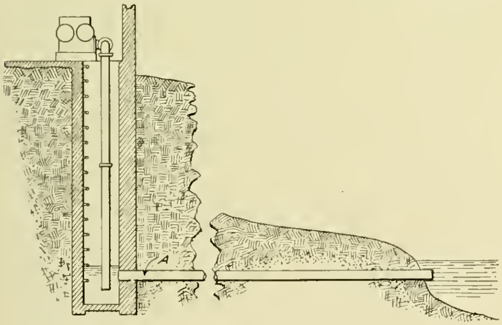


Figure 214—(F1-1).

In addition to the branches from the auxiliary main which have already been described, there are numerous low-pressure lines. These lines will be described more fully under Class H—"Low-Pressure Water Lines." Ordinarily it would be safe to assume that there should be as many water mains in a plant as there are pumps. If there are two pumps there will be but two mains necessary since it would be necessary to cut a third main into one or the other of the first two in order to get water.

Feed and Fire Pump Suction Main.

Under ordinary conditions, being free from pressure, a suction line should be simple to construct and operate were it not that the water end of a pump has such a large clearance. The contents between the suction and the discharge valves of many designs of pumps is as much as six times the volume of piston displacement. If absolute pressure is assumed as 15 pounds, the piston displacement in such pumps would reduce the pressure in the cylinder to 12.5 pounds which, in case of starting a pump without priming, would make the head about 2½ feet less than that necessary to open the suction valves. As the amount of air in the cylinder is lessened the ability of the pump to lift water is increased and if there were no air in the cylinder the amount of pump clearance would not affect the ability of the pump to lift water. This absence of air, however, is not obtainable in regular practice and the air is taken into the cylinder with the water, through leaky joints and stuffing boxes, or gases are liberated from water containing vegetable matter in solution.

The pump builder's guarantee as to what height of column his pump will lift is of little or no use in determining the relative merits of pumps. Such pump comparisons can better be made by using the ratio of piston displacement to cylinder volume and the head necessary to pass the desired quantity of water through the suction valve. All designs of pumps are affected by air in the cylinder and when the speed is lessened the quantity of air increases, which in turn lessens the lift of the pump. A pump which lifts water from a level 26 feet below that of the discharge valve must have extremely tight connections, the water handled must be free from vegetation and the pump be run quite fast to prevent even a small amount of air from accumulating in the cylinder. Such conditions are too severe for regular station work and in proportion to the shortening of the lift are pump-suction troubles reduced. It should not be inferred that pumps with short suction and with excessive air leaks in the suction connections are always operative and it is only by delivering the pump suction under a head above that of atmospheric pressure that difficulties caused by air leaks are entirely eliminated. In the case of a pump with a 2-foot lift, or under 13 pounds absolute pressure, delivering water at 150 or 165 pounds absolute pressure the air would be compressed about 1-13 of its volume which would be equivalent to the volume displacement of a piston with a 13-inch stroke when in a position ready to compress.

About the only practical way of putting in service a pump which is unable to compress the air to a sufficiently high pressure so that it will pass off through the discharge valve when such a large amount has accumulated, is to discharge the air to atmosphere through a pet cock. Feed pumps should have a valve larger in area than a pet cock located about three-quarters or one inch below the valve deck. This valve will provide a ready means of discharging the air. Another method which is sometimes used, but is nevertheless faulty, is to place a small air-discharge valve between the pump-discharge valve and the gate-stop valve in the pump discharge. To relieve a pump of air it is usually necessary to run it at a high speed. This is due to the inability of valves to properly hold air and when the water does reach the cylinder it comes in a slug. With the valve in the discharge line closed there is a physical danger under such circumstances as the water pressure may reach a destructive point in the pumps before the steam valve can be closed or the discharge opened. The advantage of closing the discharge valve is to prevent water from the pressure line leaking back into the pump through the pump valves. If the pump is provided with release valves placed between the pump and the discharge valve the operation will be satisfactory.

If the suction main for a pump is underground it should be made of cast iron and if it is subject to vibration, settlement of ground or excessive expansion strains it should be flanged and have metal gaskets. The most satisfactory arrangement for long underground suction connections is to locate the underground piping at a level below the water inlet or water surface and build the lift pipe so that it is exposed free to expand and opportunity is afforded for readily making repairs. Figure 214-(F1-1) will illustrate the details of a very satisfactory arrangement of piping for such service. The well should be about 3 feet in diameter, have a ladder inside and a man-hole top covering so arranged that the suction pipe will be supported from above. If the waterline, a, to the well is large, about 24 or 30 inches in diameter, it may be built of clay sewer pipe with cemented joints which will prevent any leakage of sand. The construction of pump suction wells is often expensive even when the work is done with cheap material. The location of the suction line below the water level brings about many difficulties such as the caving in of the trench, the handling of loose and wet earth, the laying of pipe on a soft bottom while water is flowing and difficulties with the men who are doing the work, because they must either be ignorant and incompetent men who are obliged to do such labor or if more capable, they are working with a grievance.

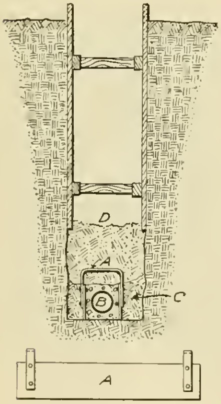


Figure 215—(F1-2).

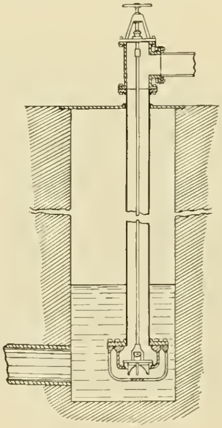


Figure 217—(F1-4).

For such work sewer pipe can be used and satisfactory results obtained, if the work is properly done, but under such conditions as prevail in this character of work it is next to impossible to lay sewer pipe properly. Cast-iron pipe is made in longer lengths which affords an opportunity for supporting the sections by filling around the centers leaving the joints clear for caulking. If pumps are used to keep the water away from the work it will be necessary to have one on either side of the hole in which the work is carried on so that the water will not interfere with the leading of the joints.

Another method of constructing such line is illustrated in Figure 215-(F1-2). With this method the larger part of the cost is for material as the work can all be done with common labor. Referring to the illustration the form, a, is made up of plates connected by handles in the shape of an inverted U. In beginning the work the trench is first dug, then the pipe, b, is screwed together and placed in approximately its final position. The metal form is then set about the pipe as shown in the drawing, and the space outside of the form filled with dirt while the inside of the form is filled with concrete to encase the pipe. As soon as the concrete and dirt have been rammed the form is withdrawn and the trench then loose filled up to the point, d, at the bottom of the planking. With this type of construction old pipe may be used as it is surrounded by concrete through which no water can leak. The work can be carried on even when the trench is wet as the pipe may serve to lead away the water during the progress of the work and the concrete can be placed in water. Two or three of these portable forms are required so that they can be moved ahead as the work advances.

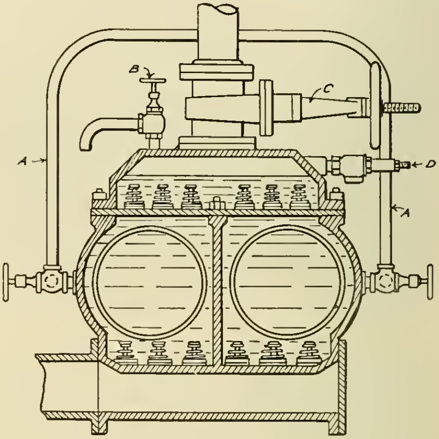


Figure 216—(F1-3).

The most satisfactory method of executing the work shown in Figure 214-(F1-1) is to build the suction well before disturbing the outside ground. With this well in operating condition the trench can be dug from the well toward the waterway and the pipe laid as fast as the dirt is removed. This will allow the water in the trench to drain to the well from which it can be removed by the regular pump or a temporary one. It is important that the joints in the pipe be tight if they are to be encased in concrete as water passing through the fresh concrete to the inside of the pipe will wash out the cement and leave only the loose material. Further mention of this subject as considered for large suction mains is discussed under the heading of "Condenser intakes—Class L."

Many suction lines are provided with foot valves which aid the pumps in holding their vacuum. The use of foot valves in quite limited. If the pump valves are in good order the foot valves will retard rather than aid the pump in its operation. When foot valves are used the pump must constantly support the weight of the valve which amounts to about ½ pound for each square inch of area or an increased lift equivalent to 1 foot. Sometimes the operation of a pump is improved by the use of a foot valve because the suction valves fail to hold, but better results could possibly be obtained by renewing or repairing the suction valves. There are some instances, however, where foot valves are indispensable for pump starting as is the case with pumps of the centrifugal type in which, when priming, it is necessary to fill the body of the pump with water and expel the air. Without a foot valve in such a pump the water would be lost through the suction. As a centrifugal pump is wholly unable to remove the air it must be removed by filling the pump with water or by using a steam ejector attached to the periphery of the pump case. If a steam ejector is used it is not necessary to use a foot valve as the ejector will support the column of water in the suction pipe. Air could also be removed with a steam ejector from the suction of a steam pump, but this process would not be as simple as the discharging of the air to atmosphere or by priming.

If the steam pump has a high lift and a large clearance in the cylinder air cannot be discharged without priming with or without a foot valve. If the ratio of the cylinder clearance to the piston displacement is but as 3 to 1 the absolute pressure in the cylinder at the end of the stroke would be five pounds, or the equivalent of a 10-foot lift and for a lift of over this amount the pump could be run indefinitely without taking water. It is not necessary to fill the suction pipe of a steam pump with water, but in nearly all cases the cylinder must be filled to reduce the clearance.

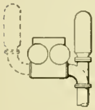


Figure 218—(F2-1).

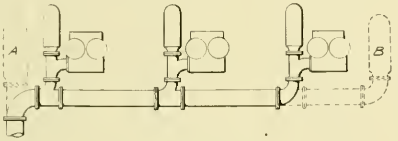


Figure 219—(F2-2).

In Figure 216-(F1-3) is shown a very simple starting device for a pump that connects with a line which always is filled with water. The pipe lines, a, can be turned on and with the valve, b, open to furnish an outlet for air (and water also in starting) and the stop valve, c, closed, the pump being protected against excess pressure by the relief valve, d, can then be started and the air removed without difficulty. The lines, a, are the priming pipes and may be connected to any water supply as pressure is not required.

That a pump requires priming to lift its water does not in the least affect its efficiency unless possibly it be increased by the reduced friction of the larger waterways. If priming water is not readily obtainable, or if a pump of the centrifugal type is used, a very satisfactory foot valve may be built as shown in Figure 217-(F1-4). With the valve so constructed if the pump is to be shut down or is about to be started, the valve can be lowered so that it will bear on its seat and operate the same as the more common types of foot valves. While the pump is in operation the valve can be raised clear of its seat. When the pump is out of service the valve can be closed tightly. A valve so constructed has so little service to perform that it should require practically no care or attention to keep it in perfect operating condition.

Suction Branches to Pumps.

It is often found necessary to connect the different suctions to one suction main. Such an arrangement should be avoided if possible and the more satisfactory one as shown in Figure 214 be used. This arrangement, with the separate suctions from each pump to the well, permits of free expansion and contraction of the line and facilitates repairs on any branch without interfering with the operation of neighboring pumps. The arrangement with separate suction pipes does away with shut-off valves, and air chambers can be omitted at the ends of the suction branches. In fact the operation of the pumps is made comparatively simple, while on the other hand connecting the different pump suctions into one main, more particularly if this main is of considerable length, brings about many difficulties.

If several suction lines are to be connected to one main the piping must be sufficiently large to supply all the pumps, thus increasing the size and number of the joints. A large main located above the water level and supplying several pumps should have a foot valve at its end to prevent emptying, otherwise, if the suction were lost considerable time would be required in which to remove the air accumulated in the large pipes. In any event long suction mains are troublesome and to avoid the shock due to the starting and stopping of the large column of water contained therein, which movements are due to the action of the pumps, it is necessary to use an air chamber which will absorb the impact. The use of a foot valve in connection with such a combination of suction pipes results in the saving of the energy of the moving column.

To be effective in relieving the pumps from shock an air chamber must be located so that the flow from the suction lines is direct to the chamber and the opening in the chamber should be of the full size of the pipe as is shown in Figure 218-(F2-1). If the suction chamber contains no obstructions the air chamber may be placed on the side of the pump opposite the suction. In no case should the air chamber be attached to the side outlet of a tee. The difficulties occasioned by water flowing to the pumps are not due to pressure, but to inertia. When water is brought to rest it should not be necessary to create a pressure in the line in order that the column of water might be diverted into an air chamber nor should it be necessary to set other water in motion which would in turn flow into the air chamber; it is this sudden retarding of moving water that causes water hammer.

In case the suction must be long and connected with two or more pumps it is necessary to cushion the movement of the long heavy body of water with as little obstruction between it and the air cushion as possible. Figure 219-(F2-2) illustrates, in full lines, a complete system for cushioning the entire moving body of water except the smaller amount in the air chambers, which amount is negligible in effect. If the pumps are close together with a short main connecting them one air chamber, as indicated at a, may be used to absorb the impact of the long line, thus allowing the inertia of the water in the connecting main to be taken up or dissipated in pumps without air chambers. In no case should the air chamber be placed at b, because it then would not quicken the movement of the long line due to the fact that a large portion of the water in the horizontal main would be at rest at the time of impact. Before this body of water could move the shock would be taken up throughout the piping. Such shocks are usually very severe and are often sufficient in amount to break the fittings even though practically no pressure is observed on the line. An air chamber on a long suction causes a pump to work more smoothly than otherwise, reduces steam consumption, and though it can be dispensed with in certain cases it is in no case an objectionable feature.

Suction Branch for Heater.

The suction branch used in connection with open heaters serves to handle water which in many cases is of a sufficiently high temperature to form a vapor if the pressure falls below the atmospheric point. To avoid reducing the pressure to a troublesome point it is necessary to place the heater at an elevation sufficiently high above the pump so that the head of water, measured from the water level in the heater to the discharge valves, will exceed that required to overcome the friction of the pipe, water ports and the resistance of the pump suction valves. By increasing the suction connections to one size larger than the pump opening and by reducing the tension of the springs on the suction valves this difference of elevation has been made as low as 2 feet, but for safe, reliable operation a head of from 4 to 5 feet should be provided.

The heater should be placed as close to the pumps as possible and the friction of the connections be reduced by using bends and long-radius fittings. This class of service requires a special hot-water pump whose parts are free from rubber and which is packed with some material not affected by hot water. Under ordinary conditions metal valves are suitable with brass plungers and rods that pass through the packing. When working in extremely hot water the packing will not retain a lubricant and for this reason a dense surface-metal is required to avoid cutting or wearing out of the packing. Cast-iron plungers are too porous and steel stems are quickly roughened by rust. Brass plungers passing through outside packing and bronze valve rods are found most satisfactory for this service.

Suction Branch from Hot-Well.

The hot-well should have a separate compartment for the pump suction. The supply to this compartment should be so arranged that the pump will not take any of the air discharged by the condenser and the suction water be free from agitation caused by the condenser discharge, which in turn would cause such cylinder oil as might enter the hot-well to be mixed with the water. The hot-well should also be arranged so that the surface of the pump-water compartment is constantly being drawn off. This will remove any such oil as may rise to the surface. The pump suction should be so placed that it cannot remove all the water from the hot-well and cause the water-seal to be broken when starting the condenser. These various requirements are quite simply met with in the arrangement shown in Figure 220-(F4-1). In this plan the pump suction is located at a low position which, as far as possible, will allow oil to rise to the surface and escape. The partition at a, should be a trifle lower than the other partitions. This will insure the water passing through the pump box rather than to the overflow. The pump suction should reach as low a level as possible so that the air-leak difficulties will be reduced to a minimum.

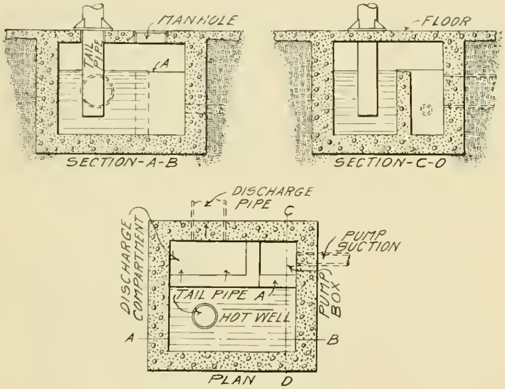


Figure 220—(F4-1).

If the suction line is of considerable length (over 50 feet) it should discharge into a small suction-well and the pump suction be taken from this well. If the condensers are of the low-down jet type with vacuum pumps the pump box would be quite similar to the hot-well, this box being located at some point along the condenser discharge and convenient for the pump suction. Figure 221-(F4-2) shows a pump box in the discharge line from the condenser, the box taking the place of an elbow. With such a box the discharge may be run straight through as shown by the dotted lines at a. Such a box may be constructed in various forms, but the following requirements should be observed: "Water enters pump box at top," "water passes over top on way to discharge" and "water shall flow to pump box rather than to overflow."

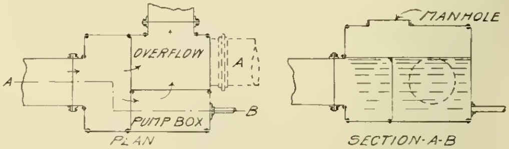


Figure 221—(F4-2).

The function of the pump box is to avoid oil in the condenser discharge. This object is very essential and if the water carries other impurities or an excessive quantity of oil it will be found advisable to pass the pump water through excelsior and renew this excelsior filter as often as it becomes clogged with oil. Figure 222-(F4-3) shows such a filter so arranged that it can be inverted while the condenser is in operation, thus raising the entire filtering device out of the water, revolving it on the line, a-b. When the filtering device is to be rolled the handle, c, is used to release the pipe-union connecting the filter chamber and the pump box. The space, d, is filled with excelsior and screens are placed at e, so that they will retain the filling. The joint between the filter case and the pump suction, which is of the tongue and groove type, may be made of leather.

There are many other materials that may be used for this work, but excelsior is so cheap, easily handled and has such a great affinity for oil and grease, which coupled with the fact that it is readily disposed of in the boiler furnace, make it a very suitable material for the purpose. The filter box can be cleaned by lifting the foul excelsior with a pitchfork and carting it away in a wheelbarrow. A plant provided with such a device and using water containing a large amount of impurities in addition to cylinder oil, uses one cubic foot of excelsior for each 100-horsepower capacity of boilers. The screening devices in this plant must be renewed once a week because the excelsior then becomes very foul. The waste excelsior is very black and has oil and grease thoroughly absorbed in the wood; this is quite a different action from material which would merely filter, as excelsior serves more as an absorbing medium.

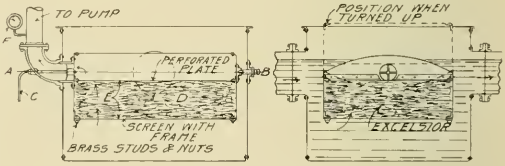


Figure 222—(F4-3).

The gauge, f, shown in Figure 222, is used to indicate the condition of the filter bed. When this bed is clear and unobstructed the gauge may show 5 inches of vacuum (depending upon the lift) and as it becomes foul it may show 6 or 7 inches due to the passage of the water through the bed becoming obstructed.

(To be continued.)

RECENT ELECTRIC RAILWAY LEGAL DECISIONS.

BY J. L. ROSENBERGER, LL. B., OF THE CHICAGO BAR.

AN ELECTRIC STREET CAR IS PERSONAL PROPERTY WITHIN MEANING OF CRIMINAL LAW.

State v. Martin (N. C.), 53 S. E. Rep. 874. Apr. 24. 1906.

In a criminal action on an indictment for wilfully and wantonly injuring an electric street car by breaking its windows with a rock, the supreme court of North Carolina holds that the car was personalty so as to render a wilful and wanton injury to it criminal under section 3676 of the Revisal of 1905, making it a misdemeanor for a person to wilfully and wantonly injure the personal property of another.

MUST USE CARE TO PREVENT TROLLEY WIRES SAGGING SO AS TO STRIKE BRAKEMEN ON TOP OF TRAINS.

Smedley v. St. Louis & Suburban Railway Co. (Mo. App.), 93 S. W. Rep. 295. Apr. 10, 1906.

At a place where the defendant's electric line crossed the line of a steam railroad the St. Louis court of appeals says that a Missouri statute required its trolley wire to be constructed, and maintained at a height of not less than 22 feet above the railroad track, and it was palpable negligence for the defendant to permit its overhead wire to hang down so that it would strike a brakeman on top of trains. That is to say, the defendant was bound to use care to prevent such an accident.

PASSENGERS VOLUNTARILY RIDING ON RUNNING BOARD DO SO AT OWN RISK, EVEN WHEN PREPARATORY TO ALIGHTING.

Rice v. Philadelphia Rapid Transit Co. (Pa.), 63 Atl. Rep. 419. Feb. 26, 1906.

The running board, the supreme court of Pennsylvania says, is not intended as a place of conveyance, but only as an aid to passengers in getting on and off the car. If passengers voluntarily ride upon it, they must do so at their own risk. And this doctrine the court applies here to the case of a woman passenger who had been standing between the seats of an open car and took a position with one foot on the running board and the other on the body of the car preparatory to alighting, but the car did not stop quite as soon as she expected.

RIGHTS IN STREETS AND BETWEEN ELECTRIC STREET CARS AND OTHER VEHICLES—LOOK AND LISTEN RULE—CARE EXPECTED OF MOTORMAN.

Indianapolis Street Railway Co. v. Marschke (Ind.), 77 N. E. Rep 945. May 18, 1906.

From side to side a city street, the supreme court of Indiana says, belongs to the public. A permission granted by the authorities to an electric railroad company to lay tracks on a public street and operate electric cars along the same, does not amount to an abandonment in favor of the company of the space occupied by the tracks. As the cars cannot turn out, and as their speed is usually greater than that of many other conveyances, they are entitled to the precedence which the necessity of the situation requires, but their movements should be regulated with a due regard to the situation of the drivers of other vehicles. It is a mistake to assume that the look and listen rule, which has found such universal acceptance with the courts in stating the quantum of care which a traveler crossing a steam railroad should ordinarily exercise, applies in all of its vigor to persons proceeding in vehicles along electric railroads in public streets. While the electric street car is expected, over much of its route, to move with comparative swiftness, yet it is a vehicle of the street, and the motorman is expected to exercise reasonable care in dealing with the various conditions with respect to travel that confront him. And again, the court says that it must not be forgotten that a person driving along a street railroad in broad daylight has a right, at least in some degree, to indulge in the supposition that if a car is approaching from the rear a proper lookout is being maintained thereon, and that ordinary care not to injure him will be exercised.

COURT TAKES COGNIZANCE THAT MOVEMENTS OF CARS ARE DIRECTED SOLELY BY CONDUCTOR—PRESUMPTION THAT SIGNAL FOR STARTING WAS GIVEN BY CONDUCTOR—WITNESS MAY STATE WHETHER HE HEARD BELL OR GONG.

Kohr v. Metropolitan Street Railway Co. (Mo. App.), 92 S. W. Rep. 1145. Feb. 5, 1906. Rehearing denied Mar. 3, 1906.

The court takes cognizance, the Kansas City court of appeals says, that the movements of street cars are directed solely by the conductor. And when it is shown that a signal for the starting of a car is given, the presumption is that it was given by the conductor, and the presumption is conclusive until it is overthrown by evidence to the contrary. Again, the court maintains that if a witness knows when a bell, and not a gong, is sounded, he may state which. He would not be required to imitate the sound for the enlightenment of the jury.

LIABILITY FOR INJURY TO PASSENGER TOUCHING LIVE WIRE HANGING FROM ROOF OF CAR.

Hopkins v. Michigan Traction Co. (Mich.), 107 N. W. Rep. 909. June 4, 1906.

The plaintiff claimed to have been injured by his hand coming into contact with a live wire hanging from the roof of the car and used to transmit electrical power to a trailer, when one was attached, for the purpose of illuminating the latter. The declaration alleged that the defendant was guilty of negligence in permitting this live wire to hang from the roof of the car; that while standing upon the platform, on account of the crowded condition of the car, the plaintiff came in contact with it, without any negligence on his part. Evidently he took hold of it with his hand, but why the declaration did not allege. The supreme court of Michigan holds that the declaration was sufficient to support a judgment based thereon. It says that if the plaintiff had good reasons for taking hold of the wire, he was not guilty of contributory negligence. If he had no occasion to touch the wire, and did it out of curiosity or voluntarily, without any necessity therefore, he would be guilty of contributory negligence. The liability depended upon the proofs.

INJURY TO PASSENGERS IN PANIC CAUSED BY SMOKER ON FRONT SEAT THROWING AWAY A LIGHTED MATCH SETTING A DRESS ON FIRE.

Fanizzi v. New York & Queens County Railroad Co. (N. Y. Sup.), 99 N. Y. Supp. 281. June 8, 1906.

The plaintiff complained that when a passenger in one of the defendant's street cars an explosion occurred on the car, accompanied by smoke and flame; that thereupon there was a panic, and he was either thrown or pushed from the car, or jumped therefrom, and was thereby injured. The defendant showed that the fuse did not blow out, and explained that some passengers were seated on the front seat smoking, of whom one struck a match, and then threw it away while lighted, so that it ignited the frock of a woman passenger, which, being of flimsy stuff, blazed into flame and caused the panic. At the close of the case and after the charge to the jury, the plaintiff stated that he would have to adopt the defendant's explanation; whereupon the court granted the defendant's motion for the direction of a verdict in its favor, and denied, under exception, the plaintiff's request for a submission to the jury of the question whether the accident happened by reason of the disobedience of a rule of the defendant that prohibited smoking by passengers save when they sat on the last three seats of such car. The second appellate division of the supreme court of New York holds that the court did not err in this.

A Strip of Land Alongside of One Used for Track Cannot Be Condemned as for an Extension or a New Line.

Metlar v. Middlesex & Somerset Traction Co. (N. J.), 63 Atl. Rep. 497. Mar. 12, 1906.

Section 13 of the New Jersey act of 1893 makes it lawful for any company organized under that act to take so much land as may be necessary for the construction of any railway built under the provisions of that act, either as an extension of the line of an existing railroad, or a new line, not exceeding 60 feet in width. A trolley company, holding under lease a strip of land 13 feet in width, upon which it had built and operated a street railway, sought to condemn an additional strip of land of less width than 47 feet lying alongside of the 13-foot strip, the new strip to be used in connection with the already existing road. The court of errors and appeals of New Jersey holds that there existed no power to condemn the additional ribbon of land under the provisions of said Section 13, as this land was not to be used either as an extension of the line of an existing railroad or a new line not exceeding 60 feet in width. It says that when the legislature spoke of an extension of the line of an existing road it meant, not widening the line of the road, but the protraction thereof.

Right of Mortgagee of Street Railway to Relief Against Long Lease of Plot of Land to Another Company—Mortgagee Having Some Directors Same as Lessor—Mortgagee Cannot Require Betterments.

Fidelity Trust Co. v. Hoboken & Manhattan Railroad Co. (N. J. Ch.), 63 Atl. Rep. 273. Mar. 6, 1906.

A plot of land belonging to a street railway corporation, and used in the prosecution of its business of carrying passengers, which was included in a mortgage of the whole plant and franchises of the railway corporation, was leased by it for 999 years, so that the lessee acquired exclusive rights to the surface of a large portion of the plot and underground privileges. The railway corporation reserved thereby a portion of the plot for the use of its surface system of railways, and was entitled, under the lease and contract, to maintain elevated tracks thereon for the use of its elevated system of railways, in substantial compliance with a plan accompanying the lease and contract. The court of chancery of New Jersey holds that the mortgagee might obtain relief against the execution of the plan proposed by the lease and contract if the plan tended to diminish the power of the street railway corporation to operate its plant under its franchises with profit.

When the owner of such a plot, subject to a mortgage which includes the plant and franchises of a railway corporation, which plot is necessary for the profitable use of the railway corporation in the conduct of its business, leases portions of the tract to another corporation which proposes to make use of the same in part for a traffic in carrying passengers, which competes with that carried on by the railway corporation, a case of threatened injury and deterioration of the mortgaged premises is presented which justifies relief.

The corporation holding in trust the mortgage securing bondholders may assert its right to relief against the deterioration of the security of the mortgage, notwithstanding some of its directors are also directors in the railway corporation which has executed the lease and contract complained of, or in a corporation which is a large stockholder therein; the relief sought being for the protection of bondholders who are beneficiaries under the trust.

But the court holds that the mortgagee of such plot has no ground for complaint of a lease of a part thereof, on the ground that thereby the railway corporation has debarred itself from enlargement of its terminal facilities, although such enlargement seems to be desirable and is claimed to be necessary in the near future. A mortgagee accepts the security as it was when the mortgage was made, and, while he may have been influenced in accepting it by a reasonable expectation that the interest of the mortgagor would require betterments which would increase his security, yet he acquires no right to require any such betterments, and has not been really injured by the present owner divesting itself of the right to make betterments.

Not Duty of Motorman to Keep Watch for Dogs on Track—When and What Care Required to Avoid Injuring Dogs.

Klein v. St. Louis Transit Co. (Mo. App.), 93 S. W. Rep. 281. Mar. 27, 1906.

An instruction given the jury in this case the St. Louis court of appeals holds, was erroneous for the reason that it declared that it was the duty of the motorman to keep a watch for dogs on the track. The court says that it is unwilling to give its assent to this doctrine. In Missouri, a steam railroad company, in running its cars at places where its tracks are not fenced and where cattle are liable to stray upon its tracks, is under the duty to keep a reasonable lookout for such animals and to use reasonable care to avoid injuring them, but dogs, while declared to be personal property by statute, and are, in a sense, domestic animals, are, in their nature and habits, not at all like cattle running on the range. Dogs when at large are always on the watch for their own safety. They are quick in motion, active and swift, and so alert that they ordinarily avoid contact with running trains and cars, hence there is no reason to apprehend that a dog, seen at some distance, on a railroad track in front of a car would remain on it and be run over, and unless there is something about the dog's actions and movements, or in his inaction, to indicate to the motorman that he is either unable to get off the track or oblivious to the approach of the car, the motorman is under no duty to stop the car to avoid injuring him. On the other hand, if the motorman has good reason to believe that the dog will not or cannot, for any reason, get off the track in time to avoid being run over, he is under the duty to use ordinary care to frighten the dog off, or check or stop the car to avoid injuring him.

Business College Pupils Entitled to Half-Rate Tickets as School Pupils Under Ordinance.

Northrop and Another as Receivers of the Richmond Passenger & Power Co. v. City of Richmond (Va.), 53 S. E. Rep. 962, 963. June 14, 1906.

A city ordinance of December, 1899, which provided that "the said company shall place on sale at convenient points within the city of Richmond, tickets to be sold and delivered to pupils presenting a certificate of enrollment in some school, at the rate of two for five cents, to be used only between the hours of 8 a. m. and 4 p. m., from Monday to Friday, inclusive," the supreme court of appeals of Virginia holds included the pupils of a business college located in the city, particularly in view of the fact that the city council had refused to accept the suggestion made by the company of an ordinance providing that it should "place on sale for the accommodation of children going to and from school, tickets at half rates," to be used only between said hours, and in view of the further fact that the pupils of this institution had been granted the privilege of using half-rate tickets until the fall of 1903, when the company made a rule by which they were denied the privilege theretofore enjoyed, and by which they were not permitted to purchase or use the half-rate tickets.

The case on page 963 the court says was identical with that on page 962, above reported, both being entitled the same, only the second case referred to another college, with regard to which there was no evidence with respect to the construction placed by the parties upon the ordinance, or that the students of such second college had at any time enjoyed the privilege of purchasing tickets at a reduced price. There seemed to be no material difference with respect to the circumstances surrounding the parties in the two cases. The court holds that the students of the second college were entitled to enjoy the same privilege as those of the first.

Liability for Injury to Boys from Electric Cars Left in Street—Legality of Occupation of Streets Immaterial—Duty to Children—Whether Boy of 13 is Within the Rule is for Jury to Say.

Denver City Tramway Co. v. Nicholas (Colo.), 84 Pac. Rep. 813. Jan. 8, 1906. Rehearing denied Feb. 5, 1906.

These instructions given the jury are reported in this case: "Plaintiff claims that the defendant was possessed of certain electric cars and left them exposed in a public street and with the appliances thereof unguarded and so insecure that the cars might be set in motion by children amusing themselves thereat, the defendant knowing that children were attracted and frequently had been attracted to such cars at the same place, and that plaintiff, being of tender years, seeing the cars so left, yielded to his natural propensity to amuse himself, and resorted thereto, and while playing about the cars the same were accidentally or ignorantly set in motion, and that by this means plaintiff was injured. Plaintiff's claim is that the injury was a permanent one, and will render him always incapable of labor or active movement. Plaintiff seeks to recover not only for this disability, but for the sufferings resulting from his injury."

"If the jury believes from the evidence that the defendant knowing that its cars were attractive to children and exposed them in a public street unfastened and unguarded, and in such a condition that a child playing thereat might ignorantly or accidentally set the same in motion, and that plaintiff was so inexperienced that he was unconscious of the danger which he incurred by amusing himself at the said cars and resorting thereto, and, by reason of the accidental or ignorant turning on of the current by the plaintiff, or the boy who was with him, the car was set in motion, and plaintiff, endeavoring to dismount therefrom, was injured, the verdict should be for the plaintiff."

"But the plaintiff is not to be allowed to recover if, upon all the evidence, it appears to you that he was conscious of the hazard and danger of resorting to the cars to amuse himself. But the conduct of the plaintiff is not to be measured by the discretion of the adult person. No greater measure of prudence, circumspection and discretion can be required of him than that reasonably to be expected of a child of the same age, capacity and experience."

The supreme court of Colorado, in affirming a judgment in favor of the plaintiff (Nicholas), holds that these instructions are in harmony with the law. It says that in its judgment the merits of the case were not affected by the legality or illegality of the occupation of the street by the defendant company. The defendant contended that, if children were attracted by and went upon its cars, this did not in law imply a duty on its part to prevent them from going thereon, and the court may say that it is supported by some authority, but in the court's judgment the weight of authority and reason is against it. Nor does the court think that there was any merit in the contentions that the plaintiff was a trespasser and was guilty of contributory negligence, according to the rule adopted by many of the states, the United States supreme court, and heretofore mentioned with favor by this court: "If an owner sees fit to keep on his premises something that is an attraction and allurement to the natural instincts of childhood, the law imposes upon him the corresponding duty to take reasonable precautions to prevent the intrusion of children, or to protect from personal injury such as may be attracted thereto." Whether this boy, the plaintiff, being 13 years of age, was sui juris (of legal capacity to act for himself) was a question which was properly left to the jury to decide by its verdict, and was sufficiently presented to it by the instructions reported.

Rights Under Determination of Commissioners as to Change of Location Not Lost by Clerk Not Giving Notice of the Decision—Permissible Operation of Road Without Certificate of Safety—Not Additional Servitude—No Damages for Inconveniences or Injury to Business of a Physician.

Parsons v. Waterville & Oakland Street Railway (Me.), 63 Atl. Rep. 728. Feb. 20, 1906.

The determination of the railroad commissioners in regard to the change of location of a street railroad, the supreme judicial court of Maine holds, is final. The omission of the clerk of the railroad commissioners, within five days after the filing of the certificate of their decision, to give notice of such determination to all parties of record, does not deprive the railroad corporation of its right to construct and operate its road, or make that a public nuisance which would otherwise be a lawful use of the street.

The operation of a street railroad for other purposes than street traffic, before the railroad commissioners have granted a certificate of its safety for public travel, is not forbidden by Section 20 of Chapter 53 of the revised statutes of Maine, it being the operation of a railroad for street traffic, without a certificate of its safety for public travel, that is prohibited. The running of cars may be for construction or other purposes entirely distinct from street traffic and public travel.

The use of a street by a street railroad is a public servitude imposing no additional burden upon the abutter. The damages paid, when the street was built, were for all time and for all public uses fairly contemplated at the time the land was taken. Such inconveniences as are inseparable from the use by the public of a public way cannot be made the foundation of an action for damages. That the plaintiff (a physician) was hindered, delayed, and inconvenienced, and people desiring to consult him professionally were kept away, because of having to cross the defendant's track, would not give him a right of action against the defendant for a lawful use of the public way.

Right of Reconstruction on Original, Deflecting Line Acquiesced in for Ten Years—Meaning of Words "Double Track" and "Turnout"—Use Showing Additional Track Not to be Turnout.

Borough of Bridgewater v. Beaver Valley Traction Co. (Pa), 63 Atl. Rep. 796. Mar. 12, 1906.

Where a company reconstructed its line following substantially the line of the road as originally built, the variation, if any, being so slight as to be immaterial, the supreme court of Pennsylvania holds that if the line as originally constructed deflected from the true center of the road to the east it was to be presumed that this was with the consent of the borough authorities, and that the continued acquiescence therein for a period of 10 years must be regarded as a ratification of what was done in this regard. It was very properly held that the line then established was the true line, and in relaying its tracks the company had the right to so regard it; and so with respect to any temporary use of the ground to the east that was necessary for the purpose of repair and reconstruction. The right to such use was implied in the grant.

The law, the court also says, attaches no peculiar meaning to the words "double track" and "turnout." They are technical, but in common and general use, and any one with the least familiarity with railroads or railways can distinguish between them. A turnout in a railway is a short line of track, having connection by means of switches with the main track. By means of it a single-track road may be used by cars moving in opposite directions, the turnout affording accommodations at the side of the track for one car while the other is passing over the main track at that point. The car thus side-tracked resumes its place on the main track after the other car has passed, by the connecting switch at the other end of the siding, or it can return through the same switch that allowed it to pass from the main track.

The track here complained of extended from a point on the west end of a street, on the road leading from said street to the western boundary of the borough, a distance of about 500 feet. The conceded fact was, that to and from the point at the eastern end, the company was operating its original track and this additional track called a "turnout," with its two-track system in the adjoining borough as a double-track road. Together they made one continuous, unbroken double-track line. To call a track of this length and so used a turnout, the court says, was to give the word a significance that it had never been allowed, and confound it with another which meant something totally different. If there was nothing else in the case to show that this additional track was not a turnout, the use to which it was put would be sufficient.

Right of Condemnation Notwithstanding Possibility of Enterprise Failing—Purposes for Which Condemned Property May be Used—Condemnation When Public and Private Uses are Combined, or Articles of Incorporation Provide for Both—May Condemn Distant Land for Power Purposes.

State v. Centralia-Chehalis Electric Railway & Power Co. (Wash.). 85 Pac. Rep. 344. May 19, 1906.

The objects for which this corporation was formed, as recited in its articles, the supreme court of Washington says, were many and somewhat varied, and those of a public and quasi-public nature were commingled with those that were purely private. Its primary purpose, however, according to the testimony of its promoter, was to build, equip and operate electric street railways in the cities of Chehalis and Centralia, and an electric railway between those two cities, to be connected to and operated with the street railways, for the purpose of carrying passengers and freight for hire. The court thinks that when it is made to appear that a promoter of an enterprise of this kind is proceeding diligently with it, and nothing is shown to have occurred that will prevent its ultimate accomplishment, the court ought not to deny the right to acquire by condemnation an essential part merely because there is a possibility that the enterprise cannot be carried to completion. There is no danger that the property condemned will be applied to uses foreign to the purposes for which it is condemned. The property does not become the private property of the condemning corporation, in the sense that it can appropriate it to uses of a private nature. It must use it for the purposes for which it condemns it, or else submit to its reversion at the suit of the state.

If a private use is combined with a public one in such a way that the two cannot be separated, then unquestionably the right of eminent domain could not be invoked to aid the enterprise; but it has been said, and it seems to this court that it is the better reason, that, where the two are not so combined as to be inseparable, the good may be separated from the bad, and the right exercised for the uses that are public. And this court thinks that it must be true, also, that when a corporation, whose articles disclose purposes some of which are public and some of which are not, seeks to exercise the right of eminent domain, the court may look to its application and the evidence introduced at the hearing to determine what its real purposes are. Moreover, while the exercise of the right of eminent domain must be guarded jealously, so that the private property of one person may not be taken for the private use of another, after all is said and done, the power to prevent property taken for a public use from being subsequently diverted to a private use must rest rather in the supervisory control of the state than in caution in permitting the exercise of the power.

The later Washington statutes conferring the power of eminent domain on electric railway companies provide that they shall have the right to appropriate lands for a right of way and "other corporate purposes," without limitation as to the locality. It seems to the court that this is broad enough to permit the condemnation of land for power purposes, however distant it may be from the proposed railway. Contrary to the statement that the public have no interest in the cost of the power the company uses to operate its railway, the court thinks the public have a vital interest in that cost. The public is interested in cheap transportation, and, since the use of the facilities nature has afforded will help acquire cheap transportation, the law should be construed rather to enable their use than to permit them to waste in idleness. The principle is distinguishable from the principle of the cases holding that a station for a power house or coal beds cannot be condemned.

Rule Requiring Transfers to be Asked For When Fare Is Paid Violates Statute and Is Unreasonable.

Lovine v. Nassau Electric Railroad Co. (N. Y. Sup.), 99 N. Y. Supp. 422. June 1, 1906.

A transfer demanded by the plaintiff before he reached the transfer point was refused upon the sole ground, it appeared, that he had not complied with a rule of the company in asking for a transfer at the time he paid his fare. Did this refusal of the conductor, acting under the company's specific instructions and in conformity to its rules, render it liable to the $50 penalty provided for by Section 39 of the New York railroad law? The appellate term of the supreme court of New York holds that it did. It says that it has been held that Sections 39 and 104 of the railroad law must be construed together, and that Section 104 provides that "every such corporation shall, upon demand, and without extra charge, give to each passenger paying one single fare a transfer, entitling such passenger to one continuous trip to any point or portion of any railroad embraced in such contract," etc. The passenger as soon as he has paid his fare becomes possessed of the absolute right to a transfer to any connecting line to which transfers are issued. That right continues up to the point at which he must leave the car to take the connecting car, and the company cannot arbitrarily restrict, limit, or abridge that absolute right which is given by statute, and which by the strict language of the statute it must recognize "upon demand and without extra charge." It may provide reasonable regulations, to the end "that public convenience may be promoted," but it would require a vivid imagination to hold that this particular rule looked toward the attainment of that lawful purpose. On the contrary, by its very nature it places upon the passenger the burden of deciding at the moment of paying his fare whether he desires to transfer to any of the various lines on which he is entitled to ride, upon the penalty, if he does not then secure a transfer, of paying an extra fare should any circumstance arise thereafter during his trip that might render it convenient or necessary for him to so transfer to a connecting line. Surely this is not such a reasonable regulation as tends to promote public convenience. And further, if the company can assert its right to enforce such a rule, it may with as much justice or reason require that the transfer shall be asked for after the passenger has ridden five blocks, or a quarter of a mile, or by a set form of language when the demand is made.

NEWS SECTION

GENERAL NEWS OF THE MONTH

Columbus Convention Circular.

The American Street & Interurban Railway Association through its secretary, Prof. Bernard V. Swenson, has issued a circular to members of the association and allied associations, explaining matters relating to the convention at Columbus, October 15-19, 1906.

The New England, Trunk Line, Eastern Canadian, and South Eastern Passenger Associations have granted the rate of a fare and one-third on the certificate plan for all points within their territory. The Central Passenger Association has granted similar rates for all territory excepting from points in the state of Ohio. The Western Passenger Association has granted the same rate from all points in its territory including all points in Colorado. The Southwestern Passenger Bureau grants the rate, excepting for points on the Fort Worth and Denver City Railway. The Trans-Continental Association grants the regular nine months rates which are in effect from Pacific Coast points daily, to Chicago, St. Louis, Minneapolis, Missouri River points, Sioux City, Council Bluffs, Omaha, St. Joseph, Kansas City, Memphis, New Orleans, etc., and which approximate two cents per mile in each direction, or about one fare and one-third for the round trip.

The usual rules are observed in granting the reduced rates on the certificate plan. Tickets for return are to be furnished only on certificates procured not sooner than Thursday, October 11 (except that when meetings are held at distant points to which authorized transit limit is more than three days, the authorized transit limit will govern), nor later than Wednesday, October 17, and will be available for continuous passage only. Certificates will not be honored for return if presented later than Tuesday, October 23. It is expected that special trains or special cars will be run to Columbus from various centers such as Boston, New York, Philadelphia, Chicago and St. Louis. New York Central Lines will run a special train leaving Boston on Sunday, October 14, at 10:45 a. m., and arriving at Columbus, Monday, October 15, at 6:58 a. m. The rate named for this meeting is a fare and a third on the certificate plan. For reservations apply to Milton C. Roach, assistant general passenger agent, New York Central Lines, 1216 Broadway, New York, or to Mr. R. M. Harris, city passenger agent, Boston & Albany Railroad, 366 Washington St., Boston. The Pennsylvania Railroad will also run a special train or cars from New York to Columbus, leaving New York at 8:25 p. m., Saturday, October 13, and arriving at Columbus at 1:40 p. m. Sunday, October 14. For accommodations on this train apply to Mr. Colin Studds, eastern passenger agent Pennsylvania Railroad, 263 Fifth avenue, New York.

An erroneous impression seems to be prevalent in some quarters in regard to hotel accommodations and rates. The secretary has been to Columbus and investigated this matter and has ascertained that the difficulty is that while applicants have been assigned a certain number of rooms at stated hotels, they have not been given specific numbers of their rooms. Up to the present it has not been practicable to give specific numbers, but notices are now being sent out giving the name of the hotel and the room number in each case; and it is assured that all who go to Columbus will be well taken care of as far as accommodations are concerned. Mr. Henry C. Pirrung, chairman of the convention committee of the Columbus Board of Trade, guarantees that regular rates will apply at all hotels in the city throughout the convention, with the understanding that two persons occupy a single room and that each person pay the regular rate for that room. Each room will be provided with two beds.

The advance copies of convention papers are now being printed, and will be mailed to member companies as soon as they are ready for distribution. The official mailing lists in the secretary's office will be used for this purpose and the advance papers of the various associations will be sent to the respective officials of the member companies.

With the circular are enclosed blanks which members are requested to fill out with the names and positions of the company's delegates to the convention in order that the registration may be worked up in advance so far as possible.

The Committee on Standardization of the Engineering Association has issued data sheets requesting information regarding rails, journals and journal boxes.

Proposed Subway and Elevated Railway for St. Louis.

The People's Elevated and Open Subway Railroad Company, represented by Thomas A. Bell, Edward A. Garvey, Thomas M. Jenkins, and associates, on September 14 applied to the Municipal Assembly of St. Louis for a 50-year franchise for a system of elevated and subway lines in the city, offering to pay the city $30,000 a year, to give a $100,000 bond as a guarantee of good faith, and to allow the city to purchase the system at the expiration of any decade during the life of the franchise, the price to be determined by a commission consisting of a city official, one person chosen by the company and one chosen by the city. It was further agreed that the company would set aside one-third of the stock to be sold to citizens at the same price as that paid by the underwriters. It is proposed to build an open subway, or depressed track system in the downtown district and an elevated structure in the less congested districts. The city seems to look with some favor upon the plan, but there is a strong sentiment that the elevated road is not as desirable as a subway for a large city and Consulting Engineers Moor and Perkins, of the Municipal Bridge and Terminal Association, are now engaged in preparing plans and data for a subway system, to be built by the city and leased to an operating company, under a plan similar to that used in New York. Mr. Perkins has expressed the opinion that a subway in Washington or Olive street, with a cross line to the Union Station, would take care of the heaviest portion of the city's traffic. Mayor Wells has expressed himself as favorably disposed toward such a plan.

Cleveland Traction Situation.

The franchise controversy in Cleveland has been further complicated by the entrance into the fight of the Cleveland Traction Company, promoted by Frank De Haas Robinson, which has applied for several franchises over the same routes as those applied for by the Forest City company. The new company offers a three-cent fare, universal transfers, 10 tickets for a quarter during rush hours, in return for a 25-year franchise. Mr. Robinson has attacked both of the other companies, stating that the contract by which the Municipal Traction Company took over the Forest City Railway Company is illegal, and that any offer to lease the Cleveland Electric property to a holding company should not be on any higher basis than 40 per cent of the par value of the stock, because the company is earning 5 per cent dividends and its franchises run for eight years. At the council meeting on September 10 a resolution was passed requesting the Cleveland Electric and the Municipal companies to submit to the council their best propositions in order that they may be submitted to the voters. The Municipal company replied that it would submit its offer as soon as it could be prepared, and the Cleveland Electric replied that the pending ordinance, providing for seven tickets for a quarter was its best offer. At the council meeting on September 24 a resolution was passed fixing October 1 as the final date for the companies to submit their propositions. Ordinances were also passed for several franchise extensions to the Municipal company.

On September 25 the secretary of state in an opinion to the local election supervisors, stated that the board has no authority to order an election not provided for by law.

On September 26 counsel for the Cleveland Electric company requested the city solicitor to bring suit to annull the grants made to the Forest City and Municipal Traction companies on the ground that Mayor Johnson was financially interested in the companies. Up to the present writing the city solicitor has taken no action on the matter.

The Municipal company is pushing work on the equipment of its power station and claims that within 30 days it will be running cars to the Public Square, using the Cleveland Electric tracks for a part of the distance on the alleged free territory. The council has fixed the amount which the company is to pay the old company for the use of its tracks.

Estimates Submitted for New York Bridge Loop.

A step further in the plans for a loop to connect the Manhattan ends of the Brooklyn and Williamsburg bridges to relieve the congestion at those points was taken on September 14, when Chief Engineer George S. Rice submitted to the plan and scope committee of the Rapid Transit Commission a report showing the comparative cost of building an elevated and a subway route. The estimates for the elevated loop contemplate an elevated structure from the Williamsburg bridge through Delancey street to the Bowery, to Park Row, to North William street, to the Brooklyn bridge, with columns 22 feet apart, making use of the present elevated structure in the Bowery and Park Row by making it double-decked, carrying the Interborough tracks on the lower section and loop tracks on the upper. Mr. Rice figures that such a structure would cost $3,550,000, including damages to property holders, and that it could be built in one year. In his treatment of the plan for a subway Mr. Rice said that it would be made a part of the comprehensive system of subways for the city as laid out by the commission, and that a four-track subway loop between the bridges, including changes at the Brooklyn bridge approach would cost $4,750,000, including easements. The cost of the whole subway system would be $16,080,000, and a subway loop connecting the Brooklyn terminals of the bridges would cost $7,430,000. The whole or any part of this subway could be built in two years. Mr. Rice also estimated that, according to the present distribution of traffic the loop would benefit 15 per cent of the persons using the Brooklyn bridge and 25 per cent of those using the Williamsburg bridge.

The report was laid over for discussion at the next meeting of the commission. During the week several organizations of Brooklyn citizens expressed themselves as strongly opposed to a subway. Controller Metz also opposed the subway, stating that it would be an elephant on the city's hands because it could get no corporation to operate it, without collecting another fare. The Brooklyn Rapid Transit Company could not operate its present equipment in a subway. At the next meeting of the commission, on September 20, a resolution was adopted to refer both plans to the committee on plans and contracts to be considered simultaneously, so as to be able to let contracts at once as soon as a decision was reached. At the meeting of the plan and scope committee on September 28, George L. Rives, counsel for the commission, was instructed to prepare contracts for both elevated and subway.

Chicago Traction Developments.

The first hearing to test the legality of the Mueller law came to an end on September 15, when Judge Thomas G. Windes, of the circuit court refused to enjoin the city authorities from issuing $75,000,000 of certificates for the purpose of purchasing the local street railway systems. The hearing began on September 3 when several tax-payers, said to represent traction interests, entered a bill of complaint asking that the city be enjoined from issuing the certificates on the ground that the Mueller law, passed by the

Illinois legislature, was unconstitutional and that subsequent city ordinances authorizing an election under the law was illegal. The city's legal representatives filed a bill of demurrer, which has now been sustained by the court. Judge Windes, in a lengthy decision, refused to grant an injunction for want of equity, and upheld every step the city had taken since the passage of the law. The court held that it was clearly the intention of the legislature to give the city the power to secure municipal ownership if it wanted it; that the issuance of the certificates imposed no debt upon the city, because the only purpose of the city was to acquire income from street railways to be purchased by the issuance of bonds; that the city has the right under the Mueller law to condemn property for the extension of the street railway system which it proposes to acquire; that all ordinances passed by the city with the purpose of furthering the working of the law are legal; and that the law is not special or local legislation. Counsel for the complainants immediately appealed the case and it will be taken before the supreme court of the state.

On September 17 the city railway companies submitted to the city their valuations of their intangible property, representing the price at which they would sell the property to the city and operate under the indeterminate license plan. The figures were $10,332,228 for the Chicago City Railway and $13,825,040 for the Chicago Union Traction Company. The figures submitted early in the summer for the tangible property were $20,103,935 and $29,294,471, making a total for the entire property of both companies $73,555,674. These figures do not include the Consolidated Traction Company owned by the Union Traction Company. Both companies stated that their estimates were based on the assumption that the life of the present franchises would average seven years more, and that the gross receipts would increase each year 5 per cent over those of the preceding year. The city authorities have declared the figures excessive, but are waiting till the experts employed by the city have completed their estimates of the values, when negotiations will be continued in the endeavor to reach a compromise.

At the council meeting on September 24 Alderman Cullerton introduced an ordinance providing that the street car fare be reduced to four cents, or seven tickets for twenty-five cents. It was referred without discussion to the committee on local transportation, a motion to refer it to another committee under suspension of the rules being lost.

Improvement of the Brooklyn Bridge Surface Tracks.

For some time the engineers of the New York bridge department in charge of the Brooklyn bridge have agreed that the surface car tracks across the structure are worn out and that the roadbed and tracks need replacing, a necessity which arises about once a year. The interruption to traffic, which usually causes much grumbling from that portion of the public using the bridge during renewal alterations, the necessity of working in sections, and the short life of the light roadbed and strap rails when installed, make the work a perplexing task.

With the purpose of avoiding, if possible, a perpetuation of these difficulties the bridge department appealed recently to the Brooklyn Rapid Transit Company and Chief Engineer W. S. Menden of that company expressed the belief that a stronger rail than the old strap rail could be devised for the trying needs of the bridge without adding materially to its burden. He suggested the use of a rail of manganese steel which he thought would last eight or ten years instead of as many months. The bridge engineers have endorsed Mr. Menden's plan and have decided to install the rails at once.

The work will be prosecuted with the greatest possible dispatch and to that end the bridge commissioner has ordered that the night service of surface cars be more extensively abandoned during its progress than ever before. Steel, crossties, and paving material are being delivered at the bridge and the work will begin on October 1. Beginning on that day surface cars will not run across the bridge structure from 8:30 p. m. to 5 a. m., except Sundays, when the all night service will be given as usual. To help replace the withdrawn surface cars extra shuttle trains will be run upon the elevated tracks and transfers freely exchanged between these and the surface cars which will be run to the plaza.

The construction will be further bettered by welding the rails. To allow for contraction and expansion under varying temperatures there will be five expansion joints in the roadbed.

The long stretches of track along the anchorages and approaches of the bridge are to be relaid with the heaviest girder rails rolled. The factor of weight does not enter on the solid parts of the bridge and a track with concrete foundation is to be laid that would be capable of bearing a heavy train load.

In order greatly to facilitate and hasten this work of track renewal the storage yard of supplies was placed in the plaza. More supplies have been placed in every available corner all the way across the structure and with the materials so close at hand the track gangs should progress rapidly. The opportunity will be improved by the electricians who will string new overhead wiring while the tracks are being renewed and thus give the whole of this congested line a new outfit for the great work it is compelled to bear.

Trolley Freight on the Groton & Stonington.—The Groton & Stonington Street Railroad, of New London, Conn., will on Oct. 1 operate a car from Groton, Conn., to Westerly, R. I., for the purpose of carrying freight. The car will make three trips a day in each direction.

Blue Hill Street Railway Asks Express and Freight Rights.—The Blue Hill Street Railway, which has a line from Boston through Milton, Readville, Canton, Norwood and Stoughton, Mass., of which a part is still under construction, has applied to the state railroad commissioners for a permit to carry express and freight on its cars. The local grants in the separate towns were secured some time ago.

New Tramways for London.—The London County Council proposes to build about 32½ miles of new lines during its next session, 9 of which it is proposed to equip with the overhead trolley system and the remainder with the conduit system. The total estimated cost is £750,000.

Anti-Smoking Ordinance at Little Rock.—The city council of Little Rock, Ark., on September 10 passed an ordinance forbidding smoking on street cars except on the rear platform, under penalty of a fine from $2 to $5 for the first offense and from $5 to $15 for repeated offenses.

Guide to Columbus.—The Columbus Railway & Light Company has issued an eight-page folder entitled a "Guide to Columbus," which contains a map of the city, lists of hotels and points of interest, with directions for reaching them, and half-tones illustrating several features of the city.

North Dakota Quits Trolley Business.—The State of North Dakota Electric Railway, which operates a street-car line 1½ miles long in Bismarck, N. D., and which is owned by the state, has been leased to the Hughes Electric Company at a merely nominal rental, because the line has been running at a loss for some time.

Trolley Freight Service for Pawtucket, R. I.—The Rhode Island Company on September 10 inaugurated a freight service between Providence and Pawtucket, R. I. Trips are made every two hours from each end of the line during the day. The freight house at Providence has been enlarged and a new one 60 x 80 feet built at Pawtucket.

Ohio Interurbans Under Supervision of Railroad Commission.—The Railroad Commission of Ohio, acting under the Wirtz law passed by the last legislature, has extended its supervision over electric railways and will in the future require them to make the same reports and to follow practically the same regulations that have been required of steam roads in the past.

New Limited Service Between Cleveland and Canton.—New limited service has recently been started over the lines of the Northern Ohio Traction & Light Company and the Canton-Akron Railroad. There are three limiteds each way daily between Cleveland and Canton in addition to three over the Northern Ohio from Cleveland to Akron, thus making six between Cleveland and Akron. They make the 62 miles in 2 hours and 40 minutes.

Publisher Sues Because Street Car Ads Injure His Business.—James H. Burns, publisher of the St. Paul Herald, has brought suit against the St. Paul City Railway Company for $1,000 damages, alleging the company has no right to carry advertisements in its cars. Mr. Burns declares that under the company's franchise it can carry only passengers, and that by carrying ads it is breaking the law, and has injured his newspaper business to the extent of $1,000.

Illinois Traction System to Enter St. Louis by Ferry.—The Illinois Traction System has made arrangements with the Venice Terminal Company and the Madison County Ferry Company to operate its cars over the ferry to St. Louis, beginning in about 60 days, or as soon as it shall have completed its tracklaying in Venice. Negotiations are still pending for the use of the Merchants' Bridge from East St. Louis, where it is expected that tracklaying will be completed by January 1.

Illinois & Iowa Railway Gets Express Contract.—The Illinois & Iowa Railway Company has made a five-year contract with the American Express Company to handle its express business between Clinton and Davenport, Ia., and Rock Island and Moline, Ill. The railway company has also been awarded a contract to handle the U. S. mail, and pouches will be taken on and thrown off once a day at Davenport, Pleasant Valley, LeClaire, Princeton and Clinton, which will give those towns a much more frequent service.

First Electric Train on New York Central.—With Vice-President W. J. Wilgus as motorman, the first electric train was run on September 30 through the tunnel of the New York Central railroad. The trip was made from High Bridge to the Grand Central station. With the exception ot the jolting up of the passengers in the run from Fifty-sixth to Fifty-second street over a "dead" track and the old style interlocking switches, the trip was made with the usual speed and a great deal more comfort than the ordinary method of railroad traffic affords.

To Test Rights of Electric Roads as Common Carriers.—The Chicago & Milwaukee Electric Railroad has filed its tariffs with the Interstate Commerce Commission, it being the intention to test the rights of electric roads under Section 3 of the Hepburn act, which prohibits common carriers from discriminating in their rates between connecting lines. Many of the steam roads have refused to make traffic agreements with electric roads and the Chicago & Milwaukee has thus taken the first step toward ascertaining its rights under the new law.

Colorado Electric Light Power & Railway Association.—The Colorado Electric Light, Power & Railway Association held its annual convention in Denver, Colo., on September 19-20. The following papers were read: "Voltage Regulation," by Leonard Wilson; "The Use of Polyphase Motors in Outlying Districts," by W. A. Carter; "Profitable Commercial Co-operation," by J. Robert Crouse; "The Lighting of Small Stores," by J. R. Cravath; "Water-type Lightning Arresters," by A. M. Ballou; "Transformer Testing and Line Records for Transformers," by E. P. Dillon; "Steam Turbines," by C. C. Chappelle. Officers were elected as follows: President, George B. Tripp, Colorado Springs, Colo.; vice-president, W. G. Matthews, Denver City Tramway Company, Denver; secretary and treasurer, John F. Dostal, Denver Gas & Electric Company, Denver.

Seattle Votes Against Municipal Ownership.—Municipal ownership of a street railway system for Seattle was defeated at a special election on September 12 by a vote of 7,180 to 5,974, only about one-half of those registered voting. It was proposed to issue bonds to the amount of $4,272,000, of which $1,172,000 was to be charged against the general fund of the city and the remainder to be an indebtedness against 20 per cent of the gross earnings of the system when in operation. The plan was to build a great street railway system, of subway and surface lines, to parallel and extend beyond the lines of the Seattle Electric Railway.

Ten-Cent Fare Case to Go to Court of Appeals.—The appellate division of the third department of the supreme court of New York on September 27 handed down a decision overruling the demurrer of the attorney general of New York to the answer set up by the Brooklyn Heights Railroad Company in the 10-cent Coney Island fare case, and affirmed the precedent set two years ago in which the company's right was upheld. This decision was given without argument in order to hasten the matter and get the case before the court of appeals as soon as possible. An appeal from the appellate decision will be taken to the court of appeals at once by the attorney general and will be argued at an early date.

Half Rates for Children in Indiana.—The McGowan syndicate lines in Indiana have recently adopted a new rule which provides that children between the ages of five and twelve years shall be carried at half-fare rates. The lines on which the new rule is effective include the Indianapolis & Northwestern, Indianapolis & Eastern, Indianapolis & Plainfield, Indianapolis & Martinsville, and Indianapolis & Western. It is understood that the Indiana Union Traction Company will adopt the new rule for all its lines on October 1. The Indianapolis & Northwestern has always had this rule, on the other roads full charge has been made for children over five, those under five being carried free.

Aurora Elgin & Chicago Milk Traffic Increases.—The milk business handled by the Aurora Elgin & Chicago Railroad has increased greatly within the past six months and the company is now handling an average of 188 cans a day. The farmers find that they can get a better price by sending the milk to Chicago than by peddling it themselves, with less trouble, because they only have to drive it to one of the stations along the line. The company expects to order a large freight automobile to carry the milk cans from the end of its own tracks at West Fifty-second street, Chicago, into the city, as freight cannot be carried on the Metropolitan Elevated tracks, over which the Aurora Elgin & Chicago enters the city.

Indianapolis Traction & Terminal Company.—This company is equipping 50 of its closed cars with No. 2 Peter Smith hot water heaters. The piping furnishing the radiating surface is arranged in an unusual manner. These cars are operated always in the same direction and the heater is located in the left rear corner of the front vestibule. Two lines of two-inch pipe extend through the entire length of the car at the left side, are dropped and carried under the floor to the opposite end and thence above the floor and along the right side of the car and connected with a return bend. On the platform is an enclosed receptacle which holds a 36-hour supply of coal. This heating equipment replaces a stove at the front end of the car.

New York City Railway Increases Wages.—The New York City Railway, which controls all of the surface lines in the borough of Manhattan, on September 16 voluntarily inaugurated an increased schedule of wages for its motormen and conductors which will add from $250,000 to $300,000 to its payroll. The new schedule, which affects about 8,000 men, provides that the pay of motormen in their first year's service shall be increased from $2.10 a day to $2.25 a day; second year, $2.25 to $2.35; third, fourth and fifth years, $2.35 to $2.45, and after five years $2.50 to $2.60. The pay of conductors in their first year's service will be raised from $2 to $2.15; second year, $2.15 to $2.25; third, fourth and fifth years, $2.25 to $2.35, and after five years, $2.35 to $2.45.

Many Charters Asked for Lines in Pittsburg.—On October 24 the state board appointed to pass upon applications for charters will give a hearing on the application of the Pittsburg Elevated Railway Company for a charter for an elevated system for Pittsburg. This company is represented by the same interests as the Pittsburg Subway Company, which recently applied for a subway charter and which intend to build a road of the kind which is most favorable to the city authorities. On September 19 a company represented by Attorney George M. Hosack gave notice that it would apply on October 24 for a charter for 15 surface and 10 elevated lines in Pittsburg, covering some of the routes for which the Pittsburg Railways Company has franchises and some that the subway company wants.

The Baggage Question with the Electrics.—Ever since the Ohio and Indiana electric lines began to negotiate with each other to determine what would be a satisfactory basis for interchangeable tickets and interline tickets, the charge to be made for baggage has been more or less a bone of contention. As the practice of the companies varied greatly the Central Electric Railway Association has been making efforts to find a basis on which all could agree. Investigations made recently show that to carry 150 pounds free and charge 20 per cent of the regular one-way fare for each 150 pounds (or fraction thereof) additional will produce approximately the same revenue as will a flat rate of 25 cents per trunk, the rate on many of the Ohio lines. The adoption of this rule would enable a road to extend the free baggage privilege and at the same time prevent its abuse by commercial travelers, while imposing no hardships on anyone. The excess baggage rate of the steam railroads in this territory is 12 per cent of the one-way fare for each 100 pounds in excess of 150 pounds; where this is on a three-cent basis it would be equivalent to 18 per cent on the two-cent basis which the interurban lines propose for their joint tarffis.

New Water Power Plant to Supply the City of Quebec, Canada.—An important addition to the developments of water powers, with which the Province of Quebec is well supplied, has been undertaken by the Quebec Railway, Light & Power Company. Up to the present time, this company has derived power from the famous Montmorency Falls, but this has proved inadequate for present needs, especially in the winter season when the water is low. Additional power has therefore become necessary so that the present development will supply an every day requirement. Owing to the conformation of the banks it is impossible to increase the power at Montmorency itself, but half a mile above the falls the river lends itself admirably to further development, for it widens and forms a natural reservoir in which to store surplus water and to provide for the season of drought. The company has erected there, according to the plans of Mr. E. A. Evans, chief engineer and general manager, a dam 84 feet high, the highest in Canada, for such a purpose. The dam is 67 feet 4 inches wide at the base and 12 feet wide at the crest, with a reservoir capacity of 52,000,000 cubic feet of water. The equipment to be furnished will consist of a 1,500 kilowatt alternating-current generator, driven by a 2,225 horsepower turbine waterwheel. The new power house is expected to be in operation by early December of this year.

Electrical Equipment for the Hudson Companies' Tunnels.—The twin tunnels of the Hudson Companies, connecting Jersey City with New York under the North river, represent the most recent development in electrical projects centering about New York City. Construction work on these tunnels was finished about a year ago and work on the electrification will begin at once. Fifty electric cars will be operated, taking their power from the third-rail. Each tunnel will have a single track; the north tube carrying the west-bound traffic and the south tube carrying the east-bound or New York traffic. The cars will be operated in trains by the Sprague-General Electric system of multiple unit control in a manner similar to that employed on the New York subway trains. Each car will be equipped with two GE-76 (160 horse-power) railway motors. Power for this new development will be supplied from a large station on the New Jersey side, located between Jersey City and Newark. Curtis steam turbines will be employed; initial equipments including two 3,000-kilowatt 11,000-volt machines and two 6,000-kilowatt 11,000-volt machines. The total power so generated will be distributed at high voltage to three sub-stations where the alternating current will be stepped down to 650 volts direct current through transformers and rotary converters. These sub-stations will be located as follows: Sub-station No. 1, Greenwich and Christopher streets, New York, containing five 1,500-kilowatt rotary converters and fifteen step-down transformers; sub-station No. 2, Washington and First streets, Jersey City, containing four 1,500-kilowatt rotary converters and twelve step-down transformers; and sub-station No. 3, Cortlandt and Church streets, New York City, containing two 1,500-kilowatt rotary converters and six step-down transformers. Each substation will, in addition, contain one spare 1,500-kilowatt transformer. It is expected that when the new line is in operation, the running time between the various suburban cities of New Jersey and New York City will be reduced one-half.

Electric Trains on the West Jersey & Seashore.—On September 18 three-car multiple-unit electric trains were operated over the West Jersey & Seashore from Camden to Atlantic City, one of the first steam roads in the United States to be electrically equipped and completed for operation as a high-speed, direct-current electric line. The first train left Camden at 7 A. M. and arrived at Atlantic City, 59 miles, at 8:38 A. M., 98 minutes, and, although the traffic was comparatively light, the season being considerably advanced, hourly trips were made during the day. Tickets were sold at the rate of $1 one way and $1.50 for the round trip. This fare is 25 cents less than the rate on the shorter steam line and the time from Camden to Atlantic City is 30 minutes longer. The West Jersey & Seashore leaves Camden as a third-rail line, but shortly out of the station it is necessary, on account of various city crossings, to use an overhead trolley for a distance of 4.9 miles. On the first public trip some time was lost on this portion of the line on account of trouble with the trolley pole, but otherwise there were no serious delays. At one point where workmen had a protective trough over the third rail their failure to remove it quickly enough on the approach of the train almost caused a slight accident, but the shoes were not injured and no time was lost on this account. At present the infrequent local steam service into Camden will be continued, but later local electric service will be established between Camden and Millville, Millville being at the end of the 10-mile branch extending from a junction at Newfield. In this event three out of four trains will be express trains between Camden and Atlantic City, while one train out of four will be a local, branching off from Newfield to Millville. Under this arrangement it will be necessary to operate trains on a 15-minute headway, the practicability of which has not yet been thoroughly tested. The West Jersey & Seashore has heretofore been a single-track line and, although not rock ballasted, as is the Pennsylvania's short steam line between Camden and Atlantic City, is, nevertheless, in fairly good condition for electrical operation. The completion of electrically equipping this line is a creditable record for the General Electric Company, which undertook the contract last December.

PERSONAL MENTION

Mr. A. T. Bushong has resigned as roadmaster of the Aurora Elgin & Chicago Railroad.

Mr. J. E. Hester has been appointed superintendent of the shops of the Winona Interurban Railway at Winona, Ind.

Mr. Edward C. Boynton has been appointed general manager of the Orange County Traction Company, of Newburg, N. Y.

Mr. W. H. Hurlburt has resigned as general manager of the Oregon Water Power & Railway Company, of Portland, Ore.

Mr. Hugar L. Hodge has been elected vice-president of the Paris, Ill., Traction Company, succeeding Mr. A. J. Hunter, resigned.

Mr. S. S. Nelson, of Ft. Wayne, Ind., has been appointed general manager of the Central Railway, of Peoria, Ill., succeeding Mr. John Finley, resigned.

Mr. William E. Gardner has been appointed superintendent of the Dedham & Franklin Street Railway, of Westwood, Me., succeeding Mr. Ezra E. Savage, resigned.

Mr. Henry Barbero has been appointed superintendent of the Evansville & Mt. Vernon Traction Company, at Evansville, Ind., succeeding Mr. A. C. Hawkins, Jr., resigned.

Mr. Richard S. Buck, consulting engineer to the department of bridges of New York City, has become a member of the firm of Sanderson & Porter, engineers, of New York.

Mr. W. J. Jones, heretofore superintendent of the Newport & Providence Railway of Newport, R. I., has been appointed general manager of the Austin (Tex.) Electric Railway.

Mr. Fred S. Berry, heretofore train dispatcher, has been appointed superintendent of the Orange County Traction Company, of Newburg, N. Y., succeeding Mr. O. G. Pouch.

Mr. H. J. Clark, heretofore superintendent and chief engineer of the Ft. Dodge, Ia., Light & Power Company, has been appointed manager, in place of Mr. H. E. Morton, resigned.

Mr. John W. Major, heretofore inspector for the Northern Indiana Railway, at St. Joseph, Mich., has been appointed to the newly created position of assistant superintendent.

Mr. Frank H. Mellinger has been appointed soliciting freight and passenger agent of the Indiana Columbus & Eastern Traction Company, succeeding Mr. E. V. McGrath, resigned.

Mr. G. W. S. Brubaker has resigned as superintendent of construction of the Shawnee (Okla.) Traction Company, which has recently completed its line from Shawnee to Tecumseh.

Mr. F. W. Hamlin, formerly trainmaster of the Columbus Delaware & Marion Railway, has been appointed master mechanic of the Eastern Ohio Traction Company, at Chagrin Falls, O.

Mr. H. J. Whitcomb, Jr., has been elected secretary of the Wisconsin Railway & Light Company, of Fond du Lac, Wis., succeeding Mr. F. B. Huntington, who resigned several months ago.

Mr. Charles S. Goodwill has been appointed general superintendent of the Saginaw-Bay City Railway & Light Company, with office at Saginaw, Mich., succeeding Mr. Edgar J. Rauch, resigned.

Mr. Carl J. Kiefer has resigned as chief engineer of the Cincinnati Milford & Loveland Traction Company, of Milford, O., to become associated with the Reliance Engineering Company, of Cincinnati.

Mr. James Empey, heretofore connected with the mechanical department of the Elmira (N. Y.) Street Railway, has been appointed master mechanic of the Dunkirk & Fredonia Railroad, of Fredonia, N. Y.

Mr. Willis E. Fertig, of Shawnee, O. T., president of the Shawnee Traction Company, has been elected president of the Muskogee Electric Traction Company, also succeeding Mr. Ira L. Reeves, resigned.

Mr. Arthur E. Reynolds, heretofore superintendent of the Benton & Fairfield Railway, Fairfield, Me., has been appointed superintendent of the Portland & Brunswick Street Railway, with office at Fairfield.

Mr. J. A. Bucknell has resigned as general freight agent of the Michigan United Railways. Mr. George F. Garrett has been appointed city superintendent at Kalamazoo, Mich., succeeding Mr. W. W. Street, resigned.

Mr. William Emmons, heretofore superintendent of the Muncie, Ind., city lines, has had his jurisdiction extended over the Bluffton and Dayton divisions of the Indiana Union Traction Company, with office at Muncie, Ind.

Mr. James R. Wood, of Champaign, Ill., heretofore division superintendent of the Illinois Traction System, has been appointed superintendent of the Springfield (Mo.) Traction Company, succeeding Mr. Jerry Fenton, resigned.

Mr. John J. Gettings, division superintendent of the Springfield avenue, Kinney street and Plank road lines of the Public Service Corporation of New Jersey, has been appointed superintendent of division Number 3, in charge of the lines of Elizabeth, Westfield, Plainfield, Rahway, Perth Amboy and New Brunswick. Mr. John McCarthy has been appointed division superintendent of the Plank road line, and Mr. Joseph Sturn has been appointed division superintendent of the Springfield avenue and Kinney street lines. Mr. H. Valentine has been appointed division superintendent of the Central avenue line.

Mr. C. W. Webster, of Harvey, Ill., has been appointed general passenger and freight agent of the Michigan United Railways, succeeding Mr. J. A. Bucknell, resigned to accept a position with the Commonwealth Power Company.

Mr. George W. Pierce has resigned as manager of the Portchester, N. Y., lines of the Consolidated Railway, but will remain as manager of the Stamford, Conn., lines. Mr. E. R. Gibert has been appointed to succeed him at Portchester.

Mr. George A. Saylor has resigned as superintendent of the Indianapolis Columbus & Southern Traction Company, with office at Greenwood, Ind., to accept a position as traveling salesman for the H. W. Johns-Manville Company, of Milwaukee, Wis.

Mr. E. V. McGrath, heretofore soliciting freight and passenger agent of the Indiana Columbus & Eastern Traction Company, has been appointed assistant general passenger and freight agent of the Toledo Urban & Interurban Railway, at Bowling Green, O.

Mr. Lawrence W. Robinson has been appointed chief engineer of the South Chicago City Railway, at South Chicago, Ill., succeeding Mr. Edwin Jowett, resigned to accept a position as assistant chief engineer of the Commonwealth Electric Company, Chicago.

Mr. John N. Akarman, who was recently promoted from the position of general passenger agent to that of general superintendent of the South Jersey division of the Public Service Corporation of New Jersey, with office at Camden, N. J., is one of the oldest operating men in the electric railway service. He began his street railway career in the service of the South Boston Street Railway, of Boston, Mass., in 1873, and in 1877 entered the service of the Middlesex Railroad Company, operating between Boston and Charlestown. After serving seven years with this company in all positions up to assistant superintendent, he was appointed superintendent of the Charles River road, and four years later was called to Worcester, Mass., as superintendent of the Citizens' Street Railway Company and later of a company formed by a consolidation of the latter with the Worcester Horse Railroad. In 1890 he resigned and, together with Mr. Charles B. Pratt and Mr. H. S. Seeley, of the Worcester Consolidated Company, built the road from Biddeford and Saco to Old Orchard Beach, Maine. Within a year he became superintendent of a company operating the street railway properties in Newark, N. J., where he remained until 1892, when he went to Worcester as general manager of the Consolidated company. He electrically equipped this property and operated it until 1901, during which period the company's earnings greatly increased. He was then general manager of the Elizabeth Plainfield and Central Jersey Railway Company, from 1901 to July 1, 1903, when it was absorbed by the Public Service Corporation of New Jersey. Mr. Akarman then became identified with that management and has since remained with it in various positions.

John N. Akarman.

Mr. Edwin A. Sturgis, superintendent of motive power of the Worcester Consolidated Street Railway, of Worcester, Mass., has resigned to become superintendent of equipment of the Massachusetts Electric Companies, of Boston, Mass. Mr. George W. Dunlap has been appointed superintendent of motive power at Worcester to succeed Mr. Sturgis.

Mr. C. C. Connell, city ticket and passenger agent of the Waterloo Cedar Falls & Northern Railway, Waterloo, Ia., has been appointed chief clerk to the general passenger and freight agent. Mr. Frank La Tier has been appointed city ticket and passenger agent to succeed Mr. Connell.

Mr. Citaro Sakuma, of Tokyo, Japan, will soon visit the United States for the purpose of studying the various transfer systems in use in this country, in the interests of the Tokyo Street Railways Company, recently formed by a consolidation of the Tokyo Electric Railway, the Tokyo Street Railway and the Tokyo Electric Car Company.

Mr. Richard McCulloch, assistant general manager of the United Railways Company of St. Louis, and Miss Mary Grace Beggs, daughter of Mr. John I. Beggs, president of The Milwaukee Electric Railway & Light Company, and of the United Railways Company of St. Louis, were married on October 10, at the Hotel Pfister, Milwaukee.

Obituary.

Henry Robinson, of Akron, O., president of the Omaha Lincoln & Beatrice Railway, of Lincoln, Neb., and a well-known banker and manufacturer, died on September 21, at Akron.

Mr. Charles Vandercook, of Austin, Ill., who built the Chicago Harlem & Batavia Street Railway, in 1881, was killed on September 21 by a Chicago & Oak Park Elevated train at Austin. He was 87 years old.

Daniel T. Hunt, Illinois manager of the American Surety Company of New York, and formerly president of the North Chicago and West Chicago Street Railway companies, died in Chicago on September 17.

J. O. Backus, assistant superintendent of the Central Illinois Traction Company, committed suicide at Mattoon, Ill., on September 7, following the verdict of the coroner's jury fixing upon him the blame for a serious accident on the company's line on September 4.

George Tatnall, of New Rochelle, N. Y., principal assistant engineer of the New York West Chester & Boston and president of the Ferrone Company of New York, died on Sept. 13 at Lynn, Mass., from injuries received on Sept. 7 by an explosion during a test of ferronite. He was 50 years of age.

Daniel O'Day, of New York, vice-president of the National Transit Company, and a director in several steam and electric railroad companies, died on September 13 at Rogan, France. Mr. O'Day has been a prominent official with the Standard Oil Company and was formerly at the head of its traffic department.

Philip Ferdinand Kobbe, director and assistant secretary of the Westinghouse Electric & Manufacturing Company, died at his summer home at Stockbridge, Mass., on September 21, at the age of 65 years. Mr. Kobbe was one of the pioneers in the electrical business, his efforts always having been devoted to the financial end. Prior to his association with the Electric Company in 1888, he was treasurer of the United States Electric Lighting Company. He entered the service of the Westinghouse company as treasurer, and he was afterwards made third vice-president and director in addition to his office at treasurer. In 1900, when Mr. Kobbe was assigned important work in the interest of Mr. Westinghouse's foreign companies, he was stricken by an attack of paralysis, from which he never fully recovered. Continued ill health compelled him to be relieved of the duties devolving upon him as treasurer and vice-president, but until his death he was a member of the board of directors and held the office of assistant secretary.

CONSTRUCTION

TRACK AND ROADWAY.

Aurora Elgin & Chicago Railroad.—It is reported that work is to begin soon on an extension of the Yorkville branch from Yorkville to Sandwich, Ill. Charles Jones, chief engineer, Wheaton, Ill.

Claremont Railway & Lighting Company.—This company has petitioned the town of Claremont, N. H., for a contract to pay part of the cost of constructing a new bridge across Sugar river at West Claremont.

Colorado & Southern Railway.—It is reported that a contract has been let to the Westinghouse Electric & Manufacturing Company for the electrical equipment of the road from Denver to Boulder, Colo. A. D. Parker, vice-president, Denver, Colo.

Columbus Railway & Light Company.—This company is building an extension of its present lines in Columbus, O., to East Columbus. E. K. Stewart, general manager, Columbus, O.

Consolidated Railway.—It is stated that the new electric service from Hartford to Rockville, Conn., over the tracks of the New York New Haven & Hartford will be opened by November 15. The overhead construction is now well under way.

Corinth & Shiloh Electric Railway.—W. W. Williams & Co., of Nashville, Tenn., has been awarded the contract for building, equipping and financing this road, which is to run from Corinth, Miss., to Shiloh Park, Tenn., and will be pleased to receive bids for ties, cars and electrical machinery.

Eastern Pennsylvania Railways Company. — This company, which is a consolidation of several roads in Schuylkill county, Pa., owned by J. G. White & Co., is planning extensive improvements and extensions, including a line between Middleport and Tamaqua, and one from Pottstown to Mauch Chunk. Several of the company's officials have been in Pottstown during the past week looking over the ground. C. G. Young, New York, constructing engineer.

East Liverpool Traction & Light Company.—It is announced that work will be started before December on the construction of a line from East Liverpool, O., to Midland, Smith's Ferry and Vanport, Pa., which will connect with the lines of the Pittsburg Railways. Van Horn Ely, Buffalo, N. Y., is president.

Elgin & Belvidere Electric Company.—It is stated that plans are being made for the construction of a 12-mile branch from Marengo to Harvard, Ill., which will connect with a line now running to Lake Geneva, Wis. Hamilton Browne, Geneva, Ill., is president.

Fort Dodge Des Moines & Southern Interurban Railway.—The work of grading between Kelley and Des Moines is progressing rapidly and it is hoped to have it completed by October 15. The work of grading the section between Lanyan and Fort Dodge will soon be completed. Tracklaying has already commenced and the company hopes to have the line ready for operation by December 10. The bridge over the Des Moines river south of Fort Dodge is to be completed in November. Homer Loring, of Des Moines, president.

Fresno Traction Company.—This company is planning to spend $200,000 for the following improvements: double tracking the Sunnyside line to Recreation Park; erecting a steel and concrete car house; constructing the company's part of the Fresno Street subway. A. G. Wishon, general manager, Fresno, Cal.

Galesburg & Kewanee Electric Railway.—Work is progressing rapidly on this company's new line between Kewanee and Galva, Ill. The ties and poles have arrived and the work of setting poles is in progress at the Kewanee end. There is still some grading to be done between Sadler's crossing and Galva, and a 60-foot bridge is to be built. R. R. Hayward, Kewanee, is general manager.

Galveston Electric Company.—This company is making extensive improvements on its line in Galveston, Tex., in the way of laying heavier rails and double tracks. H. S. Cooper, manager, Galveston.

Georgia Railway & Electric Company.—This company has made several surveys and it is stated that work will begin in January for an extension of the East Point line from Atlanta to Hapeville, Ga. Thomas K. Glenn, of Atlanta, is manager.

Hamilton & Brantford Electric Railway.—Contracts for the construction of this road from Hamilton to Brantford, Ont., have been awarded. The Canadian Westinghouse Company will furnish the electrical supplies. I. K. Pierson, chief engineer; Elmer T. Haines, secretary, Hamilton, Ont.

Hattiesburg Traction Company.—A contract has been signed for the construction of two extensions of this company's proposed line in Hattiesburg, Miss., which are to be built in advance of the main line. The first is a line out Hardy street to the Lamar county line, 3 miles; the second is for an almost equal distance out West Pine street.

Illinois Traction System.—A contract has been let to Walter Porter, of Mackinaw, for the concrete abutments for the bridge over the Mackinaw river at that point, on the line from Peoria to Bloomington. Tracklaying is in progress, with 15 miles completed and a locomotive has been leased for the use of the ballasting gang. Tracklaying on the new line from Decatur to Champaign, Ill., has been started at Seymour. The work is being delayed by scarcity of labor.

Illinois Valley Railroad.—The grading on this line from Spring Valley to Princeton, Ill., 20 miles, is practically completed. Ties and poles have arrived and it is expected that the line will be in operation by December. This line is a part of the Illinois Traction System.

Indiana Union Traction Company.—This company has recently laid a piece of track at Main and Mulberry streets in Muncie, Ind., which will give the Portland and Bluffton cars a through route to the terminal station.

Indianapolis Huntington Columbia City & Northwestern Railroad.—Construction work has been started on this road from Goshen to Turkey Lake, Ind., 13 miles. M. B. Ryan, of Silver Creek, N. Y., has the grading contract. A. E. Wiest, general manager, Indianapolis, Ind.

Indianapolis Newcastle & Toledo Electric Railway.—Thomas N. Stillwell, of Anderson, Ind., has been awarded a contract for grading 18 miles of this line from Indianapolis to Newcastle, Ind.

Inland Empire Railway.—Surveyors are at work on the extension from Moscow to Lewiston, Idaho. The road will probably run south from Moscow to a point somewhere between Joel and Howell on the Middle Fork river and from there follow the Big Potlatch to Arrow. From Arrow it will follow the Clearwater river to a point opposite Lewiston or Clarkston. It is stated that the line as now planned will necessitate the building of two bridges, one at each of the latter-named cities over the Snake river. A. M. Lupfer, chief engineer, Spokane, Wash.

Kalamazoo Elkhart & South Bend Traction Railroad Company.—John M. Caulfield, first vice-president, writes that surveys have been completed and right of way secured for this road which is to run from Kalamazoo, Mich., to South Bend, Ind., 72 miles, via Vicksburg, Parkville, Three Rivers, Constantine, Mich., and Bristol, Elkhart and Mishawaka, Ind. Construction will begin as soon as financial arrangements have been completed. The entire line will be on a private right of way 50 feet wide except through towns. Seventy-two-pound rails will be used. A. D. Harris, president, South Bend, Ind.

Lafayette & Logansport Traction Company.—The grading on this line has progressed from Logansport as far as Delphi. Ties have been distributed along the line and rails have been delivered at Rockfield and Delphi.

Lexington, Ky.—A finance committee has been appointed to raise funds for the construction of an electric railway from Lexington to Sharpsburg, Ky., via North Middletown, about 35 miles.

Lima Kenton & Marion Traction Company.—W. H. Ogan, promoter of this line to connect Lima with Kenton and Marion, O., states that the engineer sent to examine the route by eastern financiers has reported favorably and that active construction work will soon be commenced. It is planned to operate the Strang system of gasoline-electric motor cars on the road when completed.

Lima, O.—It is stated that the Columbus & Lake Michigan steam line, from Lima to Defiance, which was purchased by the Schoepf syndicate some time ago, will be converted to an electric line next spring. The Stratford Construction Company has completed maps and profiles for the line from Lima to Bellefontaine and for the air line from the latter point to Columbus. It is probable that construction on this line, as well as the extension from Defiance to Battle Creek, Mich., will also be started in the spring.

Louisville & Eastern Railway.—Right of way is being secured by J. W. Long of Louisville and T. S. Byars of Simpsonville for the construction of this road from Lakeland to Shelbyville, Ky., and when the line from Beard to La Grange is completed, which it is said will be about November 1, work will be begun on the Shelbyville extension.

Michigan United Railways.—It is stated that this company will install a third-rail system between Lansing and St. Johns for the purpose of making faster schedules.

Milwaukee Northern Railway.—This company, which is building a line from Milwaukee north to Port Washington and Fond du Lac, Wis., has completed about 20 miles of grading. An extension from the main line to North Milwaukee is now contemplated.

Minnesota Preston Decorah & Iowa Railroad.—W. P. Mason, of Minneapolis, is organizing the Dubuque Rochester & Minnesota Construction Company for the purpose of building this road from Minneapolis, Minn., to Dubuque, Ia., by way of Ft. Snelling, Hastings, Rochester and Preston, Minn., Decorah, Waukon, Monona, Elkador, Elkport, Coleburg and Holy Cross, Ia., 208 miles.

Montreal, Que.—Sir Adolphe Caron, of Montreal, is endeavoring to finance a project for an electric road from Montreal to Midland, Can., which will connect with Ottawa and Toronto.

Murphysboro & Johnston City Electric Railway.—The work of surveying this line, which will connect the towns of Murphysboro and Johnston City, Ill., has been begun. The route is 30 miles long and will run through Carbondale, Carterville, Clifford and Herrin. Neucomer & Company, of Philadelphia, represented by George Heckel of St. Louis, are promoting the enterprise.

Nashville & Huntsville Railroad.—President T. M. Steger, of Nashville, has announced that the stock for building this road from Nashville, Tenn., to Huntsville, Ala., has nearly all been subscribed. As soon as the people along the line have subscribed $250,000 the company will deposit $1,500,000 with a trust company and the construction work will be paid for in cash. The surveyors have finished locating this line, and the route includes Elkton, Lewisburg, Chapel Hill, Eagleville, Triune and Nolensville. T. M. Steger, of Nashville, is president.

New Orleans, La.—Surveys have been started for an electric road from Terre-aux-Boeufs to the central part of New Orleans, La. William J. Kelly, promoter.

New York Westchester & Boston Railway.—This company has filed maps showing its route through Mount Vernon, New Rochelle, Larchmont, Mamaroneck, Rye and Portchester, N. Y., to the Connecticut state line, also from Mount Vernon to White Plains. The City & County Contract Company, of New York, has the contract. W. L. Bull, president; W. A. Pratt, chief engineer, New York.

North Carolina Electric Company.—E. D. Steele, attorney, has announced that the contract has been let for grading the first 11 miles of this road, which is to extend from Thomasville to Greensboro and High Point, N. C., 18 miles.

Northern Colorado Power & Light Company.—This company is making plans for the construction of a street railway in Cheyenne, Wyo., and a line to connect Cheyenne and Ft. Russell.

North Columbia Land Company. — This company has commenced work on a two-mile line from Columbia College, Columbia, S. C. Gadsden E. Shaud, engineer, Columbia.

Oklahoma City Railway.—This company is arranging to extend its line on Main street westward to Clark avenue, north to Second street and thence westward to Ohio avenue. J. W. Shartel, vice-president and general manager.

Oskaloosa & Buxton Street Railway.—The grading on this line from Oskaloosa to Buxton, Ia., is nearly completed as far as Beacon, and as soon as the work at the ends is completed track laying will be started. C. B. Judd, chief engineer, Oskaloosa, Ia.

Paul Smiths Electric Light & Power & Railroad Company.—This company has been authorized by the New York Railroad Commission to build an electric line nine miles long from Lake Clear station, Harrietstown, to Saranac, with a branch from the main line to Upper St. Regis Landing. The company was incorporated some time ago with a capital stock of $100,000.

Peninsular Railroad.—It is stated that this double track electric road from Los Gatos to San Carlos, Cal., 50 miles, will be completed in about six months. Right of way has been secured for the entire distance and actual construction is about to begin. The company recently acquired a partially completed road from San Jose to Los Gatos and Saratoga Springs, 28 miles. The Southern Pacific is said to be closely connected with this enterprise.

Pittsburg Railways.—This company is making plans and surveys for a new line from Pittsburg to Carnegie, Pa., via Beechview.

Putnam & Westchester Traction Company.—This company is planning soon to build an electric railway from Peekskill to Cortlandt and Oregon, N. Y., about 4 miles. Power will be obtained from the Peekskill Lighting & Railroad Company. J. S. Ladd, Peekskill, president.

San Bernardino Valley Traction Company.—This company is securing right of way for an extension of its present line from Colton to Riverside, Cal. A. C. Denman, Jr., of San Bernardino, is president.

San Francisco Vallejo & Napa Valley Railway.—It is reported that this road, proposed to run from Vallejo to Calistoga, Cal., has been financed and that a contract has been let to M. A. Brady, of San Francisco, for the construction work. W. F. Botsford, of Los Angeles, is president.

Sandusky Norwalk & Mansfield Electric Railway.—The work of tracklaying on the extension from Plymouth to Shelby, O., has commenced. S. S. Burtsfield, Toledo, O., president and general manager.

Sedalia Transit Company.—This company will at once build an extension in Sedalia, Mo., from Third and Lamine streets to the Missouri Kansas & Texas depot.

Sharon & Wheatland Street Railway.—James McCarron, of Youngstown, O., has been awarded a contract for grading this company's line from Wheatland to West Middlesex, O., 3 miles. H. L. Patterson, of Youngstown, is chief engineer.

Shelbina, Mo.—Surveyors have begun work locating a line from Shelbina to Shelbyville, Mo., 8 miles. It is expected to extend later to Labina.

Spokane & Inland Railway.—Grading is now practically completed from Spring Valley Junction to Garfield and Palouse, Wash., and tracklaying is in progress near each of the towns. It is now expected that cars can be run into Garfield by February 1. A. M. Lupfer, chief engineer, Spokane, Wash.

Tacoma Railway & Power Company.—General Manager W. S. Dimmock, of Tacoma, Wash., has announced that this company and the Puget Sound Electric Railway, both owned by Stone & Webster, of Boston, will at once build an extension 21 miles long, from Tacoma to Puyallup, Sumner and Orting, Wash. It is stated that this line was decided upon a year ago and that surveys have been made and most of the right of way purchased. Franchises are to be applied for within the week and as soon as they are granted construction will begin. The section of the road between Puyallup and Sumner will be built first and the material is now on hand. Seventy-pound T-rails will be used.

Terre Haute Traction & Light Company.—Work has been begun on the new intake well which is a part of the improvements to be made at the power house in Terre Haute, Ind. New equipment to the amount of $600,000 will be installed, including new switchboards and motor-generating sets.

Texas Traction Company.—It is stated that incorporation papers will be filed this week to build the line from Dallas to Sherman, Tex. The capital stock will be $3,000,000. A contract has been let to Suderman & Dolson, of Galveston, and work is to begin within 30 days. The line is to be 60 miles long, with the main power house at McKinney and two substations on each side of it. J. F. Stickland, of Dallas, promoter.

Topeka, Kan.—T. T. Clendinen, of Atchison, Kan., is promoting an electric road to run from Topeka to Atchison, Kan., via Porter, Winchester and Oskaloosa.

Toronto Railway.—The construction of a downtown loop on Richmond, York and Victoria streets in Toronto, Ont., was recently begun.

Trenton Street Railway.—The extension of this company's lines connecting Trenton and Trenton Junction, N. J., was recently opened for traffic.

Tri-City Railway.—A large force of men is now at work laying a double track on Fourth avenue in Davenport, Ia., and the old 52-pound rails are being replaced by 80-pound rails, with continuous joints. The ties are being laid in concrete.

Trinidad Electric Railroad.—Engineers will soon start to locate a route for an extension from the present terminus at Starkville, Colo., to Riley canyon, 6 miles. T. F. Grover, general manager, Trinidad, Colo.

Tulsa Street Railway.—It is stated that work on this line will commence within 30 days. An official map of the road showing the route over which cars will be operated has been filed with the city.

POWER HOUSES AND SUBSTATIONS.

Alabama City Gadsden & Attalla Railway.—This company has awarded the contract to Otto T. Fisher, of Birmingham, Ala., for the erection of the two-story steel building, 50x100 feet, for its proposed $125,000 power house at Gadsden. C. J. Zell, electrical engineer, Gadsden, Ala.

Aurora Elgin & Chicago Railroad.—This company will greatly increase the capacity of its power plant at Batavia, Ill., and a new 8,000-horsepower engine is to be installed at once.

Consolidated Railway.—This company is arranging to install additional equipment with a capacity of 2,500 horsepower in its plant at Berlin, Conn. The present capacity of the plant is 2,000 horsepower.

Fort Dodge Des Moines & Southern Electric Railway.—W. J. Zitterell, of Webster City, has been awarded the contract for a power house at Fraser and four substations at Ankeny, Kelley, Boone, and Fort Dodge Junction. The substations are to be 32 feet square and about 25 feet high, of fireproof brick. The contract calls for completion by November 26.

Indianapolis & Eastern Traction Company.—A new substation has been installed at Dunreith, Ind., to take the place of the one which was burned about three weeks ago.

Jackson & Suburban Street Railway.—Joseph Williams & Co., Louisville, Ky., has been awarded a contract for the construction of this company's power house, office, car barn and shop, at Jackson, Tenn. The cost is estimated at $25,000. S. S. Bush, Louisville, Ky., vice-president and general manager.

Kansas City-Western Railway.—This company's power house at Wolcott, Kan., was entirely destroyed on September 2 by a fire caused by a short circuit. Cars are now being operated by power supplied by the Metropolitan Street Railway, of Kansas City. The building is to be rebuilt at once. Citizens of Leavenworth are making an effort to have the new power house located there instead of at Wolcott.

Lehigh Valley Transit Company.—The foundations are being laid for this company's new power house at Allentown, Pa.

Menominee & Marinette Light & Traction Company.—This company is increasing the capacity of its power plant at Menominee, Wis., by the addition of new engines and boilers.

Milwaukee Northern Railway. — The Comstock-Haigh-Walker Company, of Detroit, Mich., which is building this road from Milwaukee to Fond du Lac, Wis., has ordered the following power house and substation equipment from the Allis-Chalmers Company: horizontal twin tandem gas engines, three 1,000-kilowatt alternating-current generators, two 50-kilowatt vertical gas engine exciter sets, seven 500-kilowatt transformers, thirty-six 100-kilowatt transformers, twelve 125-kilowatt transformers, fourteen 300-kilowatt rotary converters, four 400-kilowatt rotary converters, two 45-kilovolt amperes reactive coils, main station switchboard, eight substation switchboards, and air starting equipment.

New York Westchester & Boston Railway.—It is reported that this company has awarded the contract for the construction of the main power station at East Chester, N. Y. There will also be six substations in Westchester county and the Bronx. W. A. Pratt, chief engineer, New York.

Northern Electric Street Railway (Scranton, Pa.)—This company has closed contracts for the equipment of a new power house at Dalton, Pa. The Hooven, Owens, Rentschler Company, of Hamilton, O., will furnish two 900-horsepower engines and the Westinghouse Electric & Manufacturing Company will furnish the electrical equipment.

Oklahoma Central Interurban Railway.—The business men of Sterrett, I. T., have deeded to this company 323 acres of land, part of which is to be used for a power house for the proposed road from Sterrett to Kemp, I. T.

Philadelphia Rapid Transit Company.—A contract has been let to the Weber Concrete Steel Company, of Philadelphia, for the erection of a 175-foot concrete smokestack at the power house at Beach street and Delaware avenue.

Suffolk Traction Company.—This company, it is reported, will soon require extensive equipment for a power station of about 1000-kw. capacity, which, it is stated, is to be erected at Patchogue, Long Island.

United Railways of St. Louis.—This company has secured a permit for the construction of a three-story transforming station, to cost $50,000.

Winchester & Washington City Railway (Winchester, Va.)—This company is developing a 3,000-horsepower hydraulic plant with the intention of supplying electricity to the nearby towns and for an electric railroad which will probably be built.

Winona Interurban Railway.—The new 300-kilowatt substation at Parkside, Ind., is now completed and was put into operation last week.

Youngstown & Ohio River Railroad.—This company is building a power house at West Point, O., to supply current for the line from Youngstown to East Liverpool, O., 46 miles, and for electric lighting in the towns on the line. The plant is to be completed in three months and will be equipped with two Westinghouse steam turbines. The company is investigating the latest models of electric locomotives with a view to using them for freight handling. Perry J. Chubb, of Cleveland, is superintendent of construction of the new power plant.

SHOPS AND SHOP EQUIPMENT.

Cleveland & Southwestern Traction Company.—A special committee has been appointed to prepare plans for new repair shops at Elyria, O., which is intended to supplant the present shop at Rockport, which will be retained for light repairs. C. N. Wilcoxon, general superintendent, Kamms, O.

Evansville Electric Railway.—Improvements on the car barns and sheds of this company are to be started this week. It is planned to make this the main car barn and repair shop of the company and it is stated that $10,000 will be expended in the improvements.

Grand Rapids Railway.—Plans for the remodeling of the car barns on Wealthy avenue, Grand Rapids, Mich., have just been completed by the architects and work will be started at once. A 30-foot addition will be built along the east side of the building, a new turntable has been installed in the center, and on the west side a second story will be built. A car washing room will be added in the basement and a new steam heating plant will be built.

International Railway.—This company, which controls the city and interurban lines in Buffalo and vicinity, will soon begin the construction of a car building plant and repair shop at Military road and the New York Central belt line, in Buffalo. Modern car building equipment will be installed.

Marion Bluffton & Eastern Traction Company. — Work was started recently on this company's new car barn at Marion, Ind. The building will be of brick and will be 118 feet long by 70 feet wide.

Memphis Street Railway.—This company has secured a building permit to erect a new car barn at Walnut and Linden streets, Memphis, Tenn. The building is estimated to cost nearly $100,000 and will be one story high, with brick walls, steel trusses, tile roof and cement floor. The A. Anderson Company, of St. Louis, has the contract.

Metropolitan Railway.—Land has been acquired by this company in North Toronto (Can.) on Young and De Lisle streets, for the purpose, it is reported, of erecting a car barn.

Muncie & Portland Traction Company.—This company is establishing a machine shop in connection with its power house and car barns at Detamore, Ind., where repairs may be made. The machinery has been installed.

New York Westchester & Boston Railway.—This company is contemplating the erection of a shop plant at Mt. Vernon, N. Y., and it is reported as a prospective buyer in the machinery market. W. A. Pratt, chief engineer, New York.

North Alabama Traction Company.—This company has just completed its new car barns at New Decatur, Ala., at a cost of $15,000. The building contains eight tracks, with inspection pits, and has a capacity of 38 cars. The building also contains a blacksmith and machine shop, offices, waiting room and employes' room.

Northern Illinois Light & Traction Company.—This company's new brick car barns at Ottawa, Ill., are nearing completion, and it is expected will be ready for occupancy about November 1. The building will be 131x28 feet in area and 24 feet high. Concrete inspection pits are being built under the tracks. The building also contains offices, repair shops and a waiting-room for employes.

Philadelphia & West Chester Traction Company.—Bids have been asked for the erection of a brick and concrete car barn and repair shop at Llanerch, Pa. The building will be substantially fireproof, the walls of brick, the foundations and floors of concrete and the roof beams of reinforced concrete. The dimensions will be 216x124 feet. The shops, which will run the entire length of the building, are to be 40 feet wide, and will contain two tracks built over concrete pits. The car storage portion of the building will consist of two compartments separated by a brick fire wall, each compartment containing three tracks. The storage capacity will be 24 cars. Grading for the building has already been started.

Portsmouth Street Railway & Light Company.—Plans have been completed for a new car house to be erected in the West End, Portsmouth, O., and construction will begin this fall.

Tacoma Railway & Power Company.—This company has prepared plans for a new 125x250-foot car barn and repair shop on Puyallup avenue, Tacoma, Wash., where all the cars of that end of the city will be stored and where all repairs not requiring machinery will be made. W. S. Dimmock, general manager.

FRANCHISES.

Bessemer, Ala.—The Tidewater Development Company, which is building a road from Gadsden to Tuskaloosa, Ala., has been granted a franchise through Bessemer. J. M. Dewberry, Birmingham, Ala., is president.

Butler, Pa.—The Butler Passenger Railway has applied for a franchise to occupy Pierce avenue with an additional track and to lay a track on West North and Broad streets. A. E. Reiber, manager.

Cleveland, O.—Application for a franchise has been made by the Forest City Railway Company for permission to operate an electric line in Newburg Heights, in Harvard street and Marcelline avenue, from the city limits of Cleveland to the limits of Newburg Heights.

Coffeyville, Kan.—A franchise has been granted to the Union Traction Company of Kansas, for a line through the city, entering on Eighth street. The line is projected to connect Independence and Cherryvale, Kan. C. R. McGaughey, president, Independence, Kan.

Deerfield, N. Y.—The Utica & Mohawk Valley Railway has applied for a franchise to double track its present line and make several extensions.

El Paso, Tex.—The El Paso Electric Railway has applied for an amended franchise for a line on Davis and Overland streets to the Union Depot, covering the same ground as that asked for recently by Frank R. Tobin, of St. Louis.

Everett, Wash.—W. J. McAllister and O. O. Rowland, of Seattle, have applied for a 50-year franchise for an electric and steam railway line from Index to Mineral City, Wash. The petition will be given a hearing on October 8.

Fort Pierre, S. D.—Frank G. Fisher has been granted a franchise for an electric street railway.

Gallipolis, O.—The city council has granted M. K. Duty, of Pennsboro, W. Va., a 25-year franchise to construct an electric railway in Gallipolis.

Hartford, Conn.—A special committee to which the common council referred the petition of President Mellen, of the Consolidated Railway Company, for a franchise on several streets for a double track electric railway with T-rails, in connection with the proposed interurban service between Hartford, New Britain and Waterbury, has refused to grant the franchise but asks Mr. Mellen to submit another proposition. The objection is to the type of rail and the particular streets named in the petition.

Janesville, Wis.—At a mass-meeting of the citizens held recently a resolution was sent to the city council asking it to grant a franchise to the Janesville & Madison Interurban Railway. In the meanwhile work has been suspended until the matter is adjusted.

Kent County, Md.—The county commissioners have granted a franchise to A. A. Lamkin, of New York, representing the Kent County Traction Company, for the use of the county roads between Tolchester and Chestertown, Md.

Lapeer, Mich.—Williams & Smith, of the Lapeer Gas & Electric Company, have applied for a franchise for 40 miles of electric line.

Louisville, Ky.—A franchise has been granted to the Kentucky Traction Company, from Thirteenth and Magazine streets to the end of Kentucky & Indiana Bridge Company's line.

Memphis, Tenn.—The Memphis Street Railway has applied for a franchise to double-track its lines on Calhoun, Third, Jefferson, Beale, Front, Market and Vance streets.

Menominee, Wis.—The Chippewa Valley Electric Railroad, which proposes to extend from Eau Claire to Menominee, Wis., has applied for a franchise in the latter town.

Meriden, Conn.—A franchise has been granted to the Consolidated Railway for the use of several streets in connection with the proposed electric line from Meriden to Middletown.

Moline, Ill.—A 20-year franchise has been applied for by the Moline East Moline & Watertown Railway Company for the use of certain streets in South Moline. The company contemplates reconstructing and straightening a portion of its line.

Monmouth, Ill.—The Rock Island Southern has been granted a franchise for the building of a traction line in this city. It is stated that by next spring a line will be in operation from the Three M. works to the depot. Steel for the line has been ordered for delivery in October and an express car has also been purchased for service on the line. W. W. McCullough, general superintendent.

Montreal, Que.—The Montreal & Southern Counties Railway, which has a charter to build an electric railway through the counties of Chambly, Vercheres, Rouville, St. Hyacinthe, La Prairie, St. Johns, Iberville, Missisquoi, Brome Shefford, Stanstead, Sherbrooke, Beauharnois, Chateauguay, Huntington and Napierville, has applied for a franchise to give it an entrance to the city.

New Albany, Ind.—The Louisville New Albany French Lick & West Baden Traction Company has obtained right of way through Floyd county for its proposed line from Louisville, Ky., to West Baden and French Lick, Ind. The company will absorb the electric line of the Kentucky & Indiana Bridge Company, which will be extended to connect the business centers of Louisville and New Albany.

North Bend, Ore.—A franchise has been granted to the firm of Hervitt & Bell for an electric line to connect North Bend and Marshfield, Ore. The grantees have deposited $500 as a guarantee that they will begin construction at once.

Osseo, Minn.—An exclusive franchise has been granted to the North Side Street Railway, which connects Robbinsdale and Minneapolis, Minn., for an extension through Osseo. An application for a franchise is now pending in Anoka. A. B. Robbins, of Minneapolis, is president.

Phoenix, Ariz.—A franchise for the construction of an electric railway between Phoenix and Buckeye and Phoenix and Glendale will soon be granted to S. S. Green and associates, provided certain restrictions embodied in the franchise are accepted by the grantees. Work is to be commenced within 12 months from the granting of the franchise and the company is to pay a tax of 1

Pomeroy, O.—Col. A. E. Boone, of Zanesville, O., has applied for a franchise for his proposed Pomeroy Belpre & Parkersburg Railway and for a line from Pomeroy to Wellston, O.

Pottsville, Pa.—The Middleport borough council has granted the Eastern Pennsylvania Railways a franchise through Pottsville, Pa., for its extension to Tamaqua, 6 miles. Surveys have been made and construction will begin shortly.

Provo, Utah.—The Intermountain Consolidated Railway, which proposes to build from Preston, Idaho, to Nephi, Utah, has applied for a franchise on Academy avenue, Center Third South and Fifth North streets through the city. F. M. Lyman, Jr., Salt Lake City, Utah, is chief engineer.

Redding, Cal.—The Redding & Red Bluff Electric Railway, which proposes to build from Redding to Red Bluff, Cal., has been granted an extension of three months in which to begin construction.

Rock Island, Ill.—The Moline East Moline & Watertown Railway has applied for permission to change the location of its tracks just east of the Moline city limits. The company seeks to eliminate a bad curve by extending the track 500 feet further along the line of Fifth avenue, Moline.

Sacramento, Cal.—A franchise has been granted the Sacramento Gas & Electric Railway Company for a line on Seventh and T streets.

Salt Lake City, Utah.—Don C. Robbins, of this city, has applied for a franchise to build an electric railway in Emery county, the northern terminal of which is to be at Mound, on the Rio Grande Western.

San Francisco, Cal.—A franchise ordinance has been passed giving the Presidio & Ferries Railway the right to convert its present Union street cable line into an overhead electric trolley system.

Seattle, Wash.—The Seattle Renton & Southern Railway, which operates between Seattle and Renton, has applied for a thirty-year franchise for five separate routes in Seattle, forming a series of loops. The ordinance provides for a tax on the gross earnings and gives the city the right to purchase the lines at the expiration of the franchise. W. R. Crawford, of Seattle, is president.

Spokane, Wash.—The Spokane-Pend d'Oreille Rapid Transit Company has applied for a 25-year franchise for an entrance to the city from Howard street and Second avenue east on Second avenue to Washington street. The Spokane Traction Company has applied for a franchise to extend its Cannon Hill line to Ninth avenue, Monroe street, Twelfth avenue, Mill street, Fourteenth avenue, Bernard street and Eighteenth avenue.

Springfield, Ill.—The Springfield & Western Railway has applied for a franchise on several streets of the city. The Springfield & Southeastern Traction Company will soon ask for a franchise for its line from Springfield to Pana, with an entrance on Fourteenth street.

Sulphur, I. T.—Donald Fitzgerald, representing a New York syndicate which proposes to build a line from Sulphur, I. T., to Denison, Tex., has applied for a franchise in Sulphur, promising to begin construction within three months and to complete 4 miles of track in the cty within a year, also to install a light and power plant.

Sunbury, Pa.—Sunbury & Selinsgrove Street Railway has been granted a franchise over the streets of Sunbury. Boyd Musser, secretary-treasurer.

Syracuse, N. Y.—A franchise has been granted the Syracuse Rapid Transit Railway for the double-tracking of its road in Onondaga. The track and 2 feet on each side of the rails is to be paved by the company and a highway 12 feet 7 inches wide on either side of the paving is also to be constructed by the company.

Tacoma, Wash.—The Pacific Traction Company has applied for a two-year extension of time in which to complete the lines now under construction. The Tacoma Railway & Power Company has applied for franchises for two extensions of its Tacoma lines to Bismarck. The county commissioners have set October 19 as the date for the hearing.

Toledo, O.—The Toledo Port Clinton & Lakeside Electric Railway, which has completed its line from Marblehead to Toledo, has applied for a 20-year franchise for an independent entrance to the city. The company expected to use the Starr avenue line of the Toledo Railways & Light Company, but a disagreement as to terms has impelled it to seek a franchise.

Utica, N. Y.—The Utica & Mohawk Valley Railway Company, C. Loomis Allen, Utica, general manager, has applied for a franchise for an extension of its present line on Auburn, Holland and Warren avenues.

Nampa, Idaho.—The common council has passed an ordinance granting a franchise to the Boise & Interurban Railway, which is making surveys for its line from Boise to Nampa.

Webster City, Ia.—A franchise has been granted to the Boone Webster City & Fort Dodge Interurban Railway, which proposes to build from Boone to Webster City. E. E. Hughes, Boone, Ia., is president.

Winchester, Ky.—The city council has granted to the Central Kentucky Traction Company right of way for its line to Lexington, and has sold a 20-year franchise for a street railway system to the same company, which has purchased the Winchester Railway & Light Company.

FINANCIAL

Alabama City Gadsden & Attalla Railway.—A meeting of the stockholders has been called for October 15 to consider a proposition to issue $300,000 of first mortgage 3 per cent bonds to provide for extensions and new equipment. It is proposed to build a line to Noccalula Falls, Ala.

American Railways Company.—The treasurer's report for fiscal year ending June 30, 1906, shows the following statement of income and expenses:

INCOME.		
Interest and dividends on bonds and stocks owned by the company	$331,830.66	
*Miscellaneous income	154,881.23	
Gross income		$486,711.89
DEDUCTIONS FROM INCOME.		
General expenses	$ 297.32	
Printing and registration of stocks and bonds.	4,206.69	
Legal expense	1,602.24	
Taxes	13,000.00	
Interest on funded debt	121,775.00	
Depreciation of office furniture and of engineering department instruments	600.79	
Total deductions from income		$141,482.04
Net income		$345,229.85
Dividends paid		251,385.00
Surplus		$ 93,844.85
Surplus June 30, 1905		357,820.39
		$451,665.24
Charged off on account of depreciation of Chicago Union Traction Company's capital stock	$ 71,250.00	
Adjustment of disputed taxes of the People's Railway Company of Dayton for years 1899 to 1905 inclusive	30,944.50	
	$102,194.50	
Profits from sale of securities and property..	57,617.56	
Net charges to "profit and loss"		44,576.94
Surplus June 30, 1906		$407,088.30

*Chiefly interest on advances made to sub-companies and deducted from their earnings before dividends were declared.

The report of the president, J. J. Sullivan, shows that gross earnings of subsidiary companies were $2,099,816, an increase over 1905 of $627,878. During the year 48,879,689 passengers were carried. The sum of $518,046 was expended during the year for construction and equipment on the different properties. The general balance sheet shows assets of $10,562.136.

Auburn & Syracuse Electric Railroad.—The annual report for the year ended June 30 shows an increase in both gross and net earnings and surplus. The income account compares as follows:

	1906.	1905.	1904.
Gross	$309,926	$268,507	$238,829
Expenses	183,354	162,295	159,875
Net	$126,571	$106,212	$78,954
Other income	1,182	1,065	1,505
Gross income	$127,754	$107,277	$80,459
Fixed charges	75,831	72,512	64,320
Net income	$51,923	$34,765	$16,139

Aurora Elgin & Chicago Railroad.—At a recent meeting of the directors the preferred stock was put on a 5 per cent annual dividend basis, and the first quarterly payment of 1¼ per cent will be paid October 6.

Beaumont (Tex.) Traction Company.—H. K. Johnson, president, has sold his interest in this company to the Southern Securities Company of New Orleans, and it is stated that at the next meeting of the directors a new president will be elected.

Boone Webster City & Fort Dodge Interurban Railway.—It is stated that bonds have been floated in Chicago for the construction of this road from Boone to Webster City, Ia. E. E. Hughes, president, Boone, Ia.

British Columbia Electric Railway.—This company has purchased for $10,000 the entire railway rights of the Chilliwack (B. C.) Power & Light Company, including a charter for an electric railway from Chilliwack to New Westminster, B. C., 70 miles. The new management will begin construction at an early date. R. H. Sperling, general manager, Vancouver, B. C.

Cincinnati Dayton & Toledo Traction Company.—At the annual meeting at Hamilton, O., on September 4, the following officers were re-elected: President, George B. Cox; vice-presidents, C. C. Richardson and J. B. Foraker, Jr.; secretary and treasurer, F. R. Williams.

Delaware & Magnetic Springs Railway.—This 12-mile line between Delaware and Magnetic Springs, O., has been purchased by J. A. Vandegrift, C. H. Paist and W. C. Neuhaus, of Philadelphia, and it is reported that they will extend it to connect at La Rue with the proposed line of the Lima Kenton & Marion Traction Company.

Evansville & Cannelton Traction Company.—This company, recently incorporated to build from Evansville to Tell City and Cannelton, Ind., has elected the following officers: President, F. W. Cook; vice-president, W. H. McCurdy; secretary and treasurer, Marcus S. Sonntag; Gus Muhlhausen, manager; all of Evansville.

Ft. Wayne & South Bend Electric Railway.—This company, which owns several franchises and considerable right of way between Ft. Wayne and South Bend, Ind., has been sold to interests represented by G. A. Wulkup of Chicago, and it is said that the company will be reorganized and the project pushed to completion.

Interborough Rapid Transit Company.—The report for the year ended June 30, 1906, shows a decrease in gross earnings of $141,776, but an increase in surplus over charges of $742,969. This situation was brought about by increase in the business of the subway division and the decrease in the business of the elevated roads. Gross receipts of the subway for the year were increased by $3,261,795, while the increase in the surplus over charges was $1,148,602. In contrast with this, the gross business of the elevated lines fell off $403,572, while the surplus over charges and rentals was decreased by $399,633. In making comparisons, however, it should be remembered that the subway was not open until Oct. 27, 1904, and hence the showing for 1905 indicates the results of operations for a little more than eight months. The statement of earnings and expenses for the elevated and subway division for the year is as follows:

	Elevated.	Subway.
Gross	$12,794,720	$6,900,873
Expenses	5,422,715	2,978,109
Net	$ 7,372,005	$3,922,764
Other income	363,309	352,195
Gross income	$ 7,735,314	$4,274,959
Deductions from income were as follows:		
Interest on funded debt	....	$356,666
Taxes on property	$ 146,970	26,834
Taxes on earnings and capital	189,540	....
Other taxes	1,025,364	1,850
Rentals	5,683,680	*1,410,476
Total	$ 7,045,554	$1,795,826
Net	689,760	2,479,133
Operating cost, per cent of earnings, excluding taxes	42.38	43.15

*Rentals due city of New York measured by interest on city bonds issued for construction of R. T. R. R.

Lima Kenton & Marion Traction Company.—This company, recently incorporated to build an electric line connecting the towns named, has increased its capital stock to $1,500,000 and has organized by electing the following officers: President, Joseph A. Vandegrift, New York; vice-president, Albert G. Ahlefeld, Kenton, O.; secretary and treasurer, W. N. Embert, Baltimore. The Philadelphia Trust Company is trustee, and W. H. Ogan, of Indianapolis, is the contractor. The Strang motor-car system will be used.

Lowell & Woburn Street Railway.—The Massachusetts railroad commissioners have authorized an issue of $90,000 additional capital stock with which to take up an equal amount of bonds of the old Lowell & Boston Street Railway.

Manila Electric Railroad & Light Company.—This company declared a dividend of 1 per cent on the capital stock of the company on September 25, this being the second dividend since January 1, 1906. This company operates the Manila street railway and the lighting system of Manila; the property includes about 50 miles of track and a power house of 300-kilowatts capacity. One hundred standard convertible and open American cars are operated. This is one of the most extensive public service properties in the Orient and was built by J. G. White & Company, of New York.

Marquette County Gas Light & Traction Company (Ishpeming, Mich.)—This property, including all the holdings of gas and street railway plants, equipment, buildings, grounds, etc., will be sold at public auction Tuesday, October 23, to the highest bidder. All of the company's franchises, contracts, etc., will also be included in the sale.

Northwestern Elevated Railroad (Chicago).—The annual report for the year ended June 30, 1906, shows the following statement of earnings and expenses:

Passenger earnings		$1,456,454.01
Other earnings (including loop net earnings)		492,273.27
Total earnings		$1,948,727.28
OPERATING EXPENSES.		
Maintenance of way and structure	$ 65,092.09	
Maintenance of equipment	147,387.13	
Conducting transportation	415,555.80	
General expenses	77,537.76	705,572.78
Net earnings		$1,243,154.50
CHARGES.		
*Taxes	$171,624.04	
Bond interest	783,466.53	
Other interest	7,565.92	962,656.49
Surplus for year		$ 280,498.01

The above figures include $71,700 set aside in monthly installments as a reserve for future betterments and maintenance, $41,700 on main line and $30,000 on loop division.

*Includes compensation to city on account of loop.

The daily average number of passengers carried has increased from 51,918 in 1901 and 73,460 in 1905 to 79,816 in 1906, and the total number of passengers carried during the year ended June 30, 1906, was 29,132,871 as compared with 18,950,167 for the year ended June 30, 1901. The average daily increase of passengers carried over 1905 was 6,356 or 8.65 per cent. The ratio of operating expenses, including maintenance reserve, to earnings was 46.62 per cent, and including maintenance account, loop account and taxes, was 62.72 per cent. The capital stock is $5,000,000 of preferred stock and $5,000,000 of common. $19,624,000 of bonds have been issued, but the company has bought back $1,142,000, leaving $18,482,000 outstanding.

New York City Railway Company.—The annual report of this company, which includes all the surface lines in the boroughs of Manhattan and the Bronx, and is now a part of the Interborough-Metropolitan system, has just been issued for the year ended on June 30. The statement shows an increase in gross income but the deficit has also increased. The comparative statement for 1906 and 1905 is as follows:

	1906.	1905.	Changes.
Gross earnings	$17,425,660	$16,703,003	Inc. $722,657
Expenses	9,576,511	9,315,372	Inc. 261,139
Net	$7,849,149	$7,387,631	Inc. $461,518
Other income	1,089,938	1,086,489	Inc. 3,449
Total income	$8,939,087	$8,474,120	Inc. $464,967
Charges	11,225,403	11,160,386	Inc. 65,017
Deficit	$2,286,315	$2,686,266	Dec. $399,950
Total deficit June 30	6,923,960	4,688,985	Inc. 2,234,976

Oklahoma City Lexington & Sulphur Springs Electric Railway.—This company has increased its capital stock from $3,000,000 to $3,500,000. Arrangements are being made for the completion of the line from Davis to Sulphur Springs, Okla.

Orange County Traction Company, Newburg, N. Y.—This company has been sold by the Pouch interests to ex-Governor Odell and his associates and the directorate has been entirely reorganized. The new officers elected are: President, Benjamin B. Odell, Jr.; W. Johnston Mackay, secretary; Hiram B. Odell, treasurer.

Philadelphia Bristol & Trenton Street Railway.—It is reported that negotiations have been completed for the sale of this 21-mile road, connecting Trenton, N. J., and Torresdale, Pa., to the Interstate Railways Company, of Philadelphia, which controls the Trenton Street Railway and the electric railway systems of Chester, Wilmington, Wilkesbarre, Reading and other places.

Philadelphia Rapid Transit Company.—The annual report shows the following statement of earnings and expenses for the year ended June 30, 1906, as compared with that for 1905:

	1906.	1905.
Gross	$17,483,144	$16,188,645
Operating expenses	9,153,603	8,183,637
Net	8,329,541	8,005,208
Other incomes	193,103	185,979
Total net	8,522,644	8,191,188
Tax and licenses	1,075,216	966,535
Fixed charges	7,143,431	7,116,442
Surplus	303,996	108,209
Number of passengers carried	448,576,785	402,893,245

The treasurer's statement of receipts and disbursements is as follows:

Balance as per report of June 30, 1905		$ 1,976,230
RECEIPTS.		
Passenger receipts	$17,472,792	
Chartered cars	10,352	
Advertising	99,583	
U. S. mail	43.413	
Rents real estate	21.753	
Interest	11,560	
Miscellaneous	521,914	
Capital installment on stocks	877,746	
Market St. Elevated Pass. Ry. Co. bonds	3,675,000	
Darby and Yeadon St. Ry. Co. bonds	37,000	
Open accounts	2,700,000	25,471,110
		$27,447,341
DISBURSEMENTS.		
Pay-rolls	$ 6,880,473	
Operations, construction and equipment account	10,235,288	
Advance to agents	3,000	
Advances to leased lines	78,107	
Sundry advances	4,850	
Taxes and licenses	1,634,866	
Fixed charges	8,065,623	
Real estate purchases	115,173	27,017,383
Balance		$429,957

The total trackage of the system is now 563 miles, 7.37 miles having been added during the year. At the annual meeting John M. Mack, of Philadelphia, resigned from the board of directors and was succeeded by August B. Loeb. The other directors were re-elected.

Pottstown & Northern Street Railway.—This company, operating 4 miles of road between Pottstown and Ringing Rock, Pa., has been sold to the Schuylkill Valley Traction Company, Norristown, Pa., for $28,000, and an extension will be built at once from Ringing Rock to Swamp. New officers have been elected as follows: President, George Hoeger, Norristown; secretary, Harry Roesing, Reading; treasurer, Walter Rigg, Reading.

Railways Company General (New York, N. Y.)—This company has reduced its capital stock from $900,000 to $700,000, by the purchase and retirement of $200,000 of stock.

South Side Elevated Railway.—The annual report for the year ended June 30 shows gross earnings of $1,771,989, operating expenses $1,023,810, dividends paid $412,952 and surplus $164,269.

Sterling Dixon & Eastern Electric Railway.—At the annual meeting on September 11, at Sterling, Ill., the following directors were elected: John I. Beggs, Clement C. Smith, Henry C. Higgins, John H. Lawrence and F. N. Boyer.

Tri-City Railway & Light Company (Davenport, Ia.)—A dividend of 1½ per cent has been declared on the preferred stock. The earnings for the four months ended July 31 were $515,966 gross, $188,844 net, and the surplus, after provision for fixed charges, was $98,925.

United Railways Investment Company.—A certificate has been filed with the secretary of state of New Jersey changing the name of the company by dropping the words "of San Francisco." As the company has acquired large interests outside of San Francisco it was decided that that old name had too much of a local flavor.

United Traction Company (Albany, N. Y.).—The annual report for the year ended June 30 has just been issued and shows the following comparative results for 1905 and 1906:

	1906.	1905.
Gross earnings	$1,765,223	$1,714,848
Expenses	1,116,037	1,093,712
Net income	$649,186	$621,136
Other income	19,890	17,604
Total income	$669,076	$638,740
Charges	347,072	345,232
Surplus	$322,004	$293,508
Dividends	249,980	249,997
Surplus	$72,024	$43,510

Washington Frederick & Gettysburg Electric Railway (Frederick, Md.).—This company, which proposes to build a line from Frederick to Thurmont, Md., has elected officers as follows: President, D. C. Kemp; first vice-president, Alexander Ramsburg; second vice-president, Charles Wertheimer; secretary, Charles C. Waters; treasurer, Franklin B. Smith. Contracts will be let in a few days. A power house will be built near Catoctin Furnace and an amusement park will be laid out near Yellow Springs.

Wausau Street Railway Company.—The following officers have been elected: President, Neal Brown; vice-president, Walter Alexander; treasurer, C. C. Yawkey; secretary, V. A. Alderson. It is said that two and a half miles of road will be completed this season.

RECENT INCORPORATIONS.

Atlanta Macon & Griffin Electric Railroad.—Incorporated in Georgia to build from Atlanta to Macon, through Forest, Jonesboro, Lovejoy, Hampton, Sunnyside, Griffin and Forsyth, 94 miles. Capital stock $100,000. Incorporators: N. P. Pratt, W. A. Wimbish, Clifford L. Anderson, Edwin P. Ausley, Atlanta; W. J. Massee, J. T. Moore, Minter Wimberly, W. J. Kincaid, J. M. Brawner, Seaton Grantland and N. B. Drewery, Griffin.

Bayou Teche Railway & Light Company.—Incorporated in Louisiana to build electric railways and lighting plants in New Iberia, Franklin, Lafayette, Abbeville and St. Martinsville. The electric line is to start from New Iberia as a center with branches radiating to the other towns. A franchise has been granted in New Iberia, surveys have been made and engineers have reported favorably. President, Paul M. Schneidan; vice-president, Casper Trumpy; treasurer, Frank A. Daniels; secretary, Frank A. Longshore; all of New Orleans, where the headquarters will be located.

Brady's Bend & Butler Street Railway.—Incorporated in Pennsylvania to build an electric line 20 miles long, from Brady's Bend to Butler, with a branch from Butler to Chicora. The line will connect at Butler with the Pittsburg & Butler Railway for Pittsburg. Incorporators: John Daly, Edwin W. Dewey, and others.

Centralia Electric Railway & Irrigation Company.—Incorporated with a capital of $50,000 at Centralia, Wash. Incorporators, Charles Smith, Theodore Ross, John S. Saunders, Fred T. Camp and Fred W. Thomas.

Coatesville Thorndale & Downington Railroad.—Incorporated in Pennsylvania with a capital stock of $50,000.

Concord Realty & Railway Company.—Incorporated in North Carolina to build electric railways in Concord and Charlotte and in the territory within a radius of 50 miles of Concord. Incorporators: R. A. Brown, L. A. Brown and J. L. Brown, of Concord; C. W. Johnson, of Charlotte; and E. A. Johnston, of Rock Hill.

Essex County Traction Company.—Incorporated in New York to build an electric line 41 miles long, from Westport on Lake Champlain to Newman, Essex county, New York, passing through Elizabethtown. Capital stock, $1,500,000. Incorporators: Albert L. Washburn, Norman C. Spencer, Wilbur T. Holliday and E. S. Goodrich, of Hartford Conn.; William L. Miley and Thomas D. Trumbull, of Glens Falls, N. Y.; and R. L. Trumbull, of Au Sable Forks, N. Y. Headquarters, Au Sable Forks.

Interborough Transit Company.—Incorporated in New Jersey to take over the business of the Union Transit Company, of Paterson, N. J. Capital stock, $25,000. Incorporators: John Hinchcliffe, George W. Hooper and Thomas M. Simonton, of Paterson.

Jackson Ann Arbor & Detroit Electric Railway.—Incorporated in Michigan to build a road from Jackson to Detroit, Mich., using the Northville & Plymouth road from Ann Arbor to Wayne, which the company has acquired. The company also owns a grade from Jackson to within 8 miles of Ann Arbor. Forty miles remains to be built. Capital stock, $1,900,000. Officers: President, Charles W. Osborn, New York; vice-president, W. A. Boland, New York and Jackson; secretary, George W. Mechem, Battle Creek; treasurer, N. S. Potter, Jackson.

Keystone Air Line.—Application has been made for a Pennsylvania charter to build an electric line from Pittsburg, Pa., to New

York, N. Y., which, it is said, is to form the first section of Joseph Ramsey, Jr.'s New York Pittsburg & Chicago line. It is proposed to take over the Indiana Clearfield & Eastern Railway, with 25 miles of road in Indiana and Clearfield counties; the Allentown Tamaqua & Ashland Electric Railway, with 50 miles of road in Lehigh & Schuylkill counties, and the Brush Creek & Crow's Run Railway, with 10 miles of road in Beaver county, which have arranged for extensions so that they may form one line. Capital stock, $450,000.

Lawton Interurban & Street Railway Company.—Incorporated in Oklahoma to build a line from Lawton to Fort Sill, Okla., and other points in Comanche county. Capital stock, $100,000. Incorporators: Frank Bradwell, Frank McMaster, Phil McCrory, B. F. Bowman and George Short, of Lawton, Okla.

Lawton Rapid Transit Company.—Incorporated in Oklahoma to build a 20-mile electric railway in Lawton and vicinity. Capital stock, $1,000,000. Incorporators: Neal S. Doran and E. H. Schauffler, of Kansas City, Mo.; W. M. Smith, H. A. Lloyd and J. Elmer Thomas, of Lawton.

Lewisburg & Mifflinburg Electric Railway.—Incorporated in Pennsylvania to build a road from Lewisburg through Linntown, Lochielon and Vicksburg to Mifflinburg. Capital stock, $60,000. Incorporators: J. B. Nuss, Bloomsburg, president; J. M. Nuss, Nescopec, secretary; O. B. Mellick, Bloomsburg, treasurer.

Los Angeles & Owens River Railway.—Incorporated with a capital of $10,000,000, of which amount $360,000 has been subscribed, to build and operate an electric line 328 miles long from the head of the Owens river valley to Los Angeles. It is stated that the survey will parallel the Owens river pipe line which carries the water from the valley across the desert to Los Angeles. Incorporators and first-year directors are: Wm. J. Hunsaker, A. M. Chaffey, S. P. Jewett, George Chaffey and George B. Reeve, all of Los Angeles.

Mansfield & Southern Traction Company.—Incorporated in Ohio with a capital stock of $1,000 to build a road from Mansfield to Mt. Vernon, O. Incorporators: Robert T. Gage, H. F. Parmenter, H. A. Beckett, L. M. McCraith and M. R .Moffatt, of Cleveland, O.

Marion & Western Railway Light & Power Company.—Incorporated in Ohio to build an extension of the Columbus Delaware & Marion from Marion to Richwood, O. Capital stock, $200,000. Incorporators: John G. Webb, Gus Holzbog, H. S. Hand, James S. Webb and George H. Whysall.

Moline Rock Island & Eastern Railway.—This company has been granted an Illinois charter to build an electric line from Carbon Cliff to Galesburg, Rock Island and Moline, Ill. The company will make estimates and surveys, but has no intention of constructing the line at present. Capital stock $5,000. Incorporators: Burton F. Peck, Moline; Joseph F. Porter and James F. Lardner, of Davenport; H. E. Casteel and F. G. Young, of Rock Island.

Oak Point & Elyria Railroad.—Incorporated in Ohio to build an electric railway connecting Oak Point and Elyria, O., with a branch to North Amherst. Capital stock, $3,000. Incorporators: E. S. Cook, F. S. McGowan, G. R. Manning, Jr., W. R. Dickey, Jr., and W. L. Fowler.

Pittsburg Binghamton & Eastern Railroad.—Papers have been filed with the secretary of state of Pennsylvania merging under the above name the Susquehanna Central, the Tioga & Clinton and the Pittsburg Binghamton & Eastern railway companies, and providing for the construction and operation of a line from Hyner, Pa., to Binghamton, N. Y. Capital stock, $20,000,000. F. A. Sawyer, of Canton, Pa., president.

Pittsburg & Fairhaven Railroad.—Incorporated in Pennsylvania to build a railroad which will give an entrance to Pittsburg for the New York Pittsburg & Chicago Air Line, projected by Joseph Ramsey, Jr. Capital stock, $40,000. Incorporators: William Lindsay, E. P. Patterson, and J. R. Huston, Pittsburg, Pa.

Pittsburg Subways Company.—Two charters have been granted this company in Pennsylvania, for subsidiary companies which are to be feeders for its proposed subway system in Pittsburg. The new companies are: the Lawrenceville Street Railway, capital stock $12,000, and the Rebecca Street Railway, capital stock $12,000. Incorporators: E. K. Morse, Warner Marshall, Horace F. Baker, Coleman, E. Andel, of Pittsburg, and H. M. Williamson, of Allegheny.

Rumford Falls & Bethel Street Railway.—The Maine railroad commissioners have approved the articles of association of this company which proposes to build through Mexico, Rumford, Hanover, Newry and Bethel, Me., about 30 miles. Capital stock, $120,000. Directors: Elliott W. Howe, Everett K. Day, Orville J. Gonya, William H. Ray and Dennis J. McCoy, all of Rumford.

St. Bernard Traction Company.—Incorporated in Louisiana to build or purchase electric lines in the parishes of St. Bernard and Orleans. Capital stock, $300,000. Incorporators: W. J. Kelly, M. Warrines, R. H. Warrines, Henry P. Dart, Oliver P. Livaudais and L. T. Bringier.

Texas Traction Company.—Incorporated in Texas to build an electric line from Dallas to Sherman. Capital stock, $3,000,000. Incorporators: Frank H. Profter, of Boston, Walter G. Clark and W. R. Brents, of Grayson county, J. S. Herd, of Collin county, R. H. Baker, of Travis county, W. J. Neale, of McLennan county, Fred A. Jones, of Harris county, M. B. Templeton, of Ellis county, D. A. Templeton, Osee Goodwin, J. F. Strickland and John N. Simpson, of Dallas.

ROLLING STOCK

Augusta-Aiken Railway & Electric Company is having built by J. G. Brill Company four 50-foot cars, which will have Brill 27-E 1½ trucks, and four G. E. 57 motors. Two 45-foot cars were received in April.

Boise & Interurban Railway Company is reported to have placed orders for equipment for seven new cars.

Chicago City Railway has ordered from the J. G. Brill Company and the American Car Company 100 new cars, 50 from each company. These cars are to be similar to equipment now operating on the Indiana avenue line.

Consolidated Railway Company, New Haven, Conn., has recently placed orders with the Wason Manufacturing Company for 38 closed cars, two flat cars and seven snow plows.

Easton & Washington Traction Company has ordered five cars from the Wason Manufacturing Company.

Easton Transit Company, Easton, Pa., has ordered seven cars of J. G. Brill Company.

Helena Light & Railway Company is about to receive three single truck cars from the Jewett Car Company. It denies that it is in the market for new equipment at the present time.

Indianapolis Traction & Terminal Company has ordered 30 50-foot closed cars from the Cincinnati Car Company for January 1907 delivery.

Indiana Union Traction Company is building eight box freight cars, 44 feet over all, to be operated as trailers. The trucks for these cars have been purchased.

Jersey City Hoboken & Paterson Street Railway will probably be in the market soon for equipment.

Los Angeles Pacific Company has ordered 100 cars from the St. Louis Car Company for April, 1907, delivery. The specifications include the following:—

Length, inside	48 ft. 2 in.	Top of floor to trolley base	8 ft. 10 in.
Over all	49 ft. 2 in.	Body	Wood
Width, inside	8 ft. 6 in.	Underframe	Wood and metal
Over all	9 ft. 4 in.		
Height, inside	6 ft. 9 in.		

Special Equipment.

Couplers	Washburn	Motors	General Electric No. 73
Draft Rigging	Washburn	Seats	St. Louis
Paint	Co.'s standard	Interior finish	Mahogany
Roofs	Monitor	Control system	General Electric type M
Wheels	34-in. steel tire	Floor matting	Duplex
Curtain material	Burgess Cloth and Pantasote	Sash catches	Co.'s standard

Metropolitan Street Railway, Kansas City, Mo., expects to place orders for 20 new car equipments complete, for delivery about May 1, 1907.

Omaha Lincoln & Beatrice Railway, Lincoln, Neb., has placed orders during August and September for three cars, one of which is a single-truck semi-convertible car equipped with 101-B Westinghouse motors and two of which are double-truck semi-convertible cars 44 feet over all, equipped with four 101-B Westinghouse motors. The two double-truck cars have Smith water heaters, Westinghouse air and power brakes.

Pensacola Electric Company has under order with the Jewett Car Company one express and freight car, 35 feet over-all, equipped with Van Dorn couplers, Mosier straight arc headlights, Brill 27-E trucks, four G-E-80 motors, and K-28 B controllers. The American Car Company has a contract for two 36-foot, closed body, vestibule motor cars for the same company.

St. Louis & Suburban Railway has recently ordered thirty-six four-motor G. E.-80 equipment for its 34-foot car bodies.

San Antonio Traction Company has ordered four Brill semi-convertible cars with Brill double trucks and G. E.-67 motors from the American Car Company.

San Diego Electric Railway is building cars in its shops at San Diego, Cal., at the rate of about six a year. Four interurbans for use between San Diego and National City are now under construction.

Schenectady Railway Company has ordered 12 car bodies from the St. Louis Car Company for delivery six in December, 1906, and six in January, 1907. These cars will be about 29 feet long between corner posts.

South Chicago City Railway is rebuilding a number of old cars converting two single-truck cars into one double-truck car.

Southwest Missouri Electric Railway will build about 10 cars next year at its Webb City shops.

Toronto Railway Company is building a number of cars in its shops at Toronto, Ont.

Twin City Rapid Transit Company has recently ordered equipment for cars it is building in its own shops.

Union Street Railway, New Bedford, Mass., has ordered from J. M. Jones' Sons six 30-foot vestibule cars equipped with Taylor trucks, G. E. motors, Christensen air brakes, and Consolidated Car Heating Company's heaters. Two baggage and express cars are under construction, one by J. G. Brill Company and the other by J. M. Jones' Sons. Each of these cars is 30 feet long and they are to be added to the electric express between Fall River and New Bedford.

TRADE NOTES

Featherstone Foundry & Machine Company, Chicago, has increased its capital stock from $250,000 to $450,000.

Chicago Pneumatic Tool Company, Chicago, has opened a southern office at 1012 Memphis Trust Building, Memphis, Tenn., in charge of J. Francis Small.

Ohio Brass Company, Mansfield, O., reports that it is now filling an order for 264 Tomlinson automatic car couplers for the Denver City Tramway Company, Denver, Colo.

Indiana Car & Equipment Company, Logansport, Ind., has been incorporated with a capital of $50,000, by L. J. Smith, C. H. Pennington, F. J. Lewis, H. A. Dorner and H. R. Adams.

Rust Boiler Company, Pittsburg, has received an order for 16 Rust water tube boilers of 400 horsepower capacity for the new plant of the United States Steel Corporation at Gary, Ind.

Michigan Malleable Iron Company, Detroit, has appointed as manager of sales, A. D. McAdam, who has resigned as local auditor at Detroit of the American Car & Foundry Company to accept this position.

Detroit Seamless Steel Tubes Company, Detroit, has appointed Thomas B. Arnold southwestern representative with headquarters at St. Louis. Mr. Arnold has until recently been with the Railway Steel Spring Company.

Allis-Chalmers Company, Milwaukee, Wis., reports that recent orders taken bring the total unfilled business on its books in excess of $12,000,000, or about double the amount booked at this time last year. The West Allis extensions will be entirely completed about the first of the year.

Coe Brass Manufacturing Company, Torrington, Conn., has contracted with the Ransome & Smith Company, New York, for the construction of a new three-story machine shop, 50 by 140 feet, and a two-story blacksmith shop, 50 by 140 feet, both buildings to be constructed of reinforced concrete.

Chase-Shawmut Company, Newburyport, Mass., has secured a large contract for the bonds and installation for the Northern Electric Company, which is building a line from Chico to Oroville, Cal. The company has also secured the order for bonds for the Cleveland Ashland & Mansfield Railway.

Mr. J. Lester Woodbridge, formerly engineer of the sales department of the Electric Storage Battery Company, Philadelphia, has been appointed chief engineer of that company, succeeding Mr. J. B. Entz, who has resigned to accept the position of vice-president of the Electric Vehicle Company, of Hartford, Conn.

Kansas City Portland Cement Company, Independence, Mo., has ordered as a part of the boiler room equipment of its new plant two standard economizers and an induced draft apparatus consisting of two steel plate fans with direct connected engines, all to be manufactured by the B. F. Sturtevant Company, Boston.

Mr. Horatio A. Foster, consulting electrical and mechanical engineer, of Philadelphia, the author of "Foster's Handbook of Electrical Engineering," on October 1 became associated with Mr. L. B. Stillwell, consulting electrical engineer, of New York, as resident engineer in charge of the Baltimore office, in the Continental building.

Blake Signal & Manufacturing Company, Boston, Mass., during the past year has furnished the complete signal equipment for the Illinois Traction System, and has also equipped portions of the East St. Louis & Suburban Railway, Indiana Union Traction Company, Chautauqua Traction Company, and the Worcester Consolidated Street Railway.

Pittsburg Gage & Supply Company, Pittsburg, is erecting a new brick and steel building, 154x174 feet, which will be occupied by its jobbing and manufacturing departments. Property adjoining this new building will be used for storage yards. The completion of this factory will give the company about 60 per cent more floor space than at present.

Cairo Contracting & Dredging Company, Cairo, Ill., has been organized to undertake a $60,000 contract for filling and other work in connection with the new terminals at Cairo for the Cairo & Thebes Railroad. The company will also do other work. President, J. B. Magee; vice-president, Angus Leek; secretary and treasurer, Charles Feuchter.

McLeer Engineering Company, 340 Pearl street, New York City, since installing the Passburg vacuum drying and impregnating system have secured a contract for impregnating all the field coils used on the Coney Island & Brooklyn Railroad and the New York & Queens County Railway. These two companies are also having their old coaches impregnated by this system.

Westinghouse Electric & Manufacturing Company advises that the United States circuit court of appeals for the seventh circuit has handed down a decision affirming the lower court in the case of the General Electric Company against the Kuhlman Electric Company. The suit refers to the infringement of the Dobrowolsky patent No. 422,746, owned by the General Electric Company. The Kuhlman company was manufacturing polyphase transformers in which the cores of the different elements are combined in an integral structure. The patent in suit was sustained by the United States circuit court and the Kuhlman structure held to be an infringement thereof. The practical result of this last decision of the United States circuit court of appeals is to secure to the General Electric and Westinghouse companies the exclusive right to manufacture polyphase transformers having their cores combined in an integral structure as distinguished from a plurality of single-phase transformers.

B. F. Sturtevant Company, Boston, reports a large number of sales of the new Sturtevant enclosed engine including orders from the Jeansville Iron Works Company, Hazelton, Pa.; Rand-Avery Supply Company, Boston; MacArthur Brothers Company, etc. The company is installing forced exhaust and blast apparatus for the Morse Twist Drill & Machine Company, New Bedford, Mass.; Brown & Sharpe Manufacturing Company, Providence, R. I., and other well known concerns.

Bayonet Trolley Harp Company, of Springfield, Ohio, has recently sent a large shipment of its detachable trolley harps to Peru, S. A. The order for this shipment was secured in the face of sharp competition, and no doubt was due to the satisfaction the railway company received from a trial order of their harps several months ago. This company says that the month of September has been a record breaker in the number of new roads to adopt the detachable harp.

Mr. Carl H. Reuter, 623 Land Title building, Philadelphia, has secured the sole agency from Felix Hamburger, of New York, importer of the Brunsviga calculating machine, for the United States and Canada. Mr. Reuter is the importer of the Burkhardt arithmometer. He makes a specialty of multiplying and dividing machines and is glad to furnish for 30 days' trial either or both machines. He has sold a large number in this country and has received many letters from users in which they state the excellence of the machines.

H. M. Byllesby & Co., Chicago, announces that Samuel C. Shaffner, formerly engineer and general manager of the Illuminating Company, Mobile, Ala., and R. G. Hunt, formerly manager and engineer of the San Diego (Cal.) Consolidated Gas & Electric Company, have joined the engineering staff of the company and will be located at the Chicago office. O. A. Farrar, formerly with the Allis-Chalmers Company, is now in charge of the construction of a large electric lighting plant which H. M. Byllesby & Co. is building at Mobile, Ala.

Stone & Webster Engineering Corporation, Boston, Mass., has been incorporated in Massachusetts with a paid-in capital of $250,000 and has acquired the engineering, construction and purchasing departments of Stone & Webster. The company is prepared to undertake the designing of electric railway, lighting and power plants, water power developments ,transmission lines and distributing systems, and to construct such plants either as agents or as contractors; also to examine operating plants with a view to suggesting economies. Russell Robb, president; Dwight P. Robinson, vice-president and general manager.

Hope Webbing Company, Providence, R. I., manufacturer of all kinds and styles of good tape, is again building an addition to its large plant. Fifteen years ago the company started into the manufacturing of tape and webbing with a small plant and 100 employes. To-day that plant has been increased by many additions, to twelve times its former capacity, and 1,200 workers are now required to keep up with the increasing demand for the product. A new department of manufacturing has just been added to the plant, the making of woven sleeving, a product that is now very generally used in finishing the winding of electrical fields, coils, etc.

National Brake & Electric Company, Milwaukee, Wis., reports orders during the past month for approximately 400 National airbrake equipments for the following companies: Chicago City Railway Company, United Railways of San Francisco, Oakland Transit Company, Spokane Traction Company, Metropolitan Street Railway, Rapid Transit Railway, Dallas Consolidated Railway, San Diego Electric Railway, Worcester Consolidated Street Railway, Michigan United Railways, Twin City Rapid Transit Company, Chattanooga Railways Company, York Street Railway, Memphis Street Railway, Birmingham Railway Light & Power Company, Knoxville Railway & Light Company, and Pensacola Electric Terminal Railway. The company also reports orders for electrical machinery aggregating 1,900 kilowatts.

Cincinnati Frog & Switch Company, 53 St. Paul Building, Cincinnati, has been incorporated with a capital of $200,000 and expects to break ground in about 10 days on extensive works for the manufacture of frogs, switches, crossings, switch stands and rail braces. The company has purchased five acres of ground adjoining the Factory Colony's site in Oakley. It is hoped to have the new works in operation by January 1. President, Charles W. Partington, for the past 20 years connected with the Weir Frog Company, of Cincinnati; vice president and chief engineer, George Ashton, who was for nine years with the Weir Frog Company, but for the past five years has been vice-president of the American Frog & Switch Company of Hamilton, O.; secretary and treasurer, E. R. Heitzman. The other incorporators include Herman Erdman of the G. A. Gray Company, Cincinnati, and A. E. Endebrock.

Canadian Westinghouse Company, Ltd., Hamilton, Ont., has a contract from the Montreal Light, Heat & Power Company for a large addition to the power equipment of its new Soulanges Canal power station on the St. Lawrence river, including three Westinghouse 3,750-kilowatt revolving-field alternating-current, two-bearing generators connected to water turbines. These generators are 7,200 alternations, 4,000 volts, three-phase, operating at 225 revolutions a minute. There are also two Westinghouse 150-kilowatt direct-current 125-volt exciter units and 13 2,500-kilowatt oil-insulated, water-cooled transformers. Seven of these transformers will be used for raising the voltage at the generating station from 4,000 to 44,000 volts, and six of them will be used at the lowering end of the transmission line, stepping down the voltage from 44,000 to 12,000.

ADVERTISING LITERATURE

Allis-Chalmers Company, Milwaukee.—Bulletin No. 1416, 28 pages, illustrates and describes Gates rock and ore breaker, style K.

Crocker-Wheeler Company, Ampere, N. J.—Bulletin No. 66 describes the W motor for rolling mills, 220 volts, one speed, series or compound.

Sterling-Meaker Company, Newark, N. J.—This company has issued a 30-page catalogue picturing and describing five modern fare registers for cars.

Newton Machine Tool Works, Philadelphia, Pa. Catalogue No. 44 deals with keyseat milling machines of various types, including double locomotive keyseat milling machines.

H. W. Johns-Manville Company, New York.—This company has issued a pamphlet describing and illustrating the Manville fire extinguisher, of which over 400,000 have been sold.

Buffalo Forge Company, Buffalo, New York.—An account of the test of Buffalo Forge Company's engine No. 1256, a 12 and 18 by 20 horizontal tandem compound high speed engine at Cornell University.

C. Lee Cook Manufacturing Company, Louisville, Ky.—Pamphlet describes Cook's metallic packing with illustrations showing its application to valve stems and piston rods, together with a list of some of its users.

Gould Storage Battery Company, 1 West Thirty-fourth St., New York.—A pamphlet of 12 pages and cover 3½ by 8½ inches telling about the Gould telephone batteries. It is printed on tinted paper and bound with a silk cord.

Chicago Pneumatic Tool Company.—This company has just issued its new compressor catalogue, consisting of 118 pages printed in two colors, describing several new types and sizes of compressors, including the new Hamilton-Corliss machine.

Bliss Electric Car Lighting Company, Milwaukee, Wis.—Bulletin No. 30 has 24 pages, 8 by 10½ inches, and describes the Bliss system for lighting railway cars. It is printed in two colors on enameled paper and has over 20 excellent illustrations.

Stanley-G. I. Electric Manufacturing Company, Pittsfield, Mass.—Bulletin No. 609 illustrates and describes G. I. outlet boxes of various types. The company has also issued several new circulars describing direct-current motors and generators, arc lamps, etc.

Buffalo Forge Company, Buffalo, N. Y.—Catalogue No. 97 describes the Buffalo air washer and humidifier. It has 36 pages and cover, 6 by 9 inches. It is filled with illustrations and has a table of contents covering one page, giving an outline of the matter in the pamphlet.

Nernst Lamp Company, Pittsburg, Pa.—"The Lighting of Public Buildings" is the title of the handsome standard size 6x9 pamphlet illustrated with views of railway station buildings, public office buildings, government buildings, schools and colleges, and other public buildings lighted by Nernst lamps.

American Society for Testing Materials. — Pamphlet of 101 pages containing the by-laws, list of members, committees and outline of the proceedings of the ninth annual meeting held at Atlantic City, June, 1906, published by the society. Secretary, Edgar Marburg, University of Pennsylvania, Philadelphia, Pa.

Expanded Metal & Corrugated Bar Company, Frisco Building, St. Louis.—A pamphlet of 24 pages describing the Johnson and Universal types of corrugated bars and their use in reinforced concrete construction. The pamphlet is printed in two colors of ink and contains a large number of illustrations.

Alberger Condenser Company, 95 Liberty street, New York.—Catalogue No. 6, a standard size 6x9 inch publication, describes Wainwright feed water heaters, expansion joints, heat extractors, air coolers and other Alberger condensing apparatus. Illustrations of this and other Alberger machinery are also presented.

Consolidated Car Heating Company, Albany, N. Y.—A new catalogue of switches for electric heaters, car lights, headlights and switch-boards, 20 pages 7½ by 9 inches. Electric heater catalogue No. 8, part 2, has also just been issued. This has 24 pages and cover. Both are printed on heavy paper and are well illustrated.

H. B. Underwood & Co., Philadelphia, have issued a 36-page book illustrating and describing the company's special tools for repair shops, including the various portable boring bars, of which this company makes a specialty. The company also issues a pamphlet giving directions for setting up and operating their portable cylinder boring bars.

Arnold Company, Chicago.—The Arnold Company has prepared Bulletin No. 15 descriptive of the Ivorydale shops of the Cincinnati Hamilton & Dayton, recently completed at Ivorydale, Ohio. The bulletin contains 12 large pages with illustrations of the plans and showing the progress of the work during construction of the shops. The main feature of the plant consists in the use of a rectangular engine house in place of a roundhouse. This is located on one side of the transfer pit and the erecting shop is served by the same transfer table, and located on the opposite side of the pit. Reinforced concrete was used for this engine house and also for the oil house. The bulletin describes, under organization and construction, the method which is used by the Arnold company in work of this kind. The company undertakes to build a complete shop and make the basis of the charge cost plus a percentage of cost plus a fixed sum. This is the modern way of getting results quickly and efficiently and the description of the system as used at Ivorydale by the Arnold company will be found of more than passing interest.

Quincy-Manchester-Sargent Company, Old Colony Building, Chicago.—An elaborate catalogue describing the line of material that is now handled by this company. It is a 6x9 publication, fully indexed and arranged specially for reference. Provision is made for further additions, the entire catalogue being built upon the loose leaf system with a substantial cover so that changes can be made from time to time and the same kept thoroughly up to date.

National Brake & Electric Company, Milwaukee, Wis.—Bulletin No. 370 tells of the National air compressors. Shortly after the acquisition of the plant of the Christensen Engineering Company, the National Brake & Electric Company decided to bring out new and improved apparatus to conform with the present demands for up-to-date air brake purposes, and the pamphlet describes the compressors which have been the result of the work of the company.

Hutchins Car Roofing Company, Penobscot Building, Detroit, Mich.—A new catalogue of 16 pages and cover 8½ x 11 inches, describing in detail the car roofing made by the company. This includes the Hutchins outside metal roof, all-metal inside roof and plastic roofing. The illustrations are especially fine. The company has offices at 26 Cortlandt St., New York, and 1707 Railway Exchange, Chicago, and is represented by leading supply houses in other cities.

S. F. Bowser & Company, Fort Wayne, Ind.—Bulletin No. 51 presents a description, with illustrations, of an oil switch and measuring equipment installed for H. Behlen & Bro., 31 Pearl street, New York, a concern handling volatile and explosive liquids. The equipment consists of 14 tanks with a total capacity of 40 barrels, and the liquids, among which are included varnish, turpentine, ammonia, wood alcohol and shellac, are handled entirely outside of any building.

John Davis Company, Chicago.—Catalogue S has 42 pages illustrating and describing the steam specialties made by the company including reducing valves, relief valves, steam traps, back-pressure valves, separators, blow-off valves, pump regulators, automatic pump governors, indicators, etc. There is also a sectional catalogue of 16 pages devoted entirely to separators for exhaust steam and oil. These are all printed on heavy enameled paper and are filled with excellent illustrations.

J. G. Brill Company, Philadelphia, Pa.—This company is just receiving from the press a book of 36 pages and cover, 12½ x 10¼ inches, entitled "Order Guide for Supplies and Car and Truck Specialties." It is filled with large half-tone illustrations, showing in numbered detail the names of the different parts of trucks and other equipment. It describes the Brill grooveless post convertible and semi-convertible cars and other equipment. The book should prove very valuable for reference purposes.

Miller Anchor Company, Norwalk, O.—A catalogue of 24 pages illustrating and describing guy anchors, augers and hollow stem tamping bars. A letter from Professor R. G. Dukes of Case School of Applied Science tells of a test where a No. 3 anchor was inserted in the ground to a depth of about seven feet and a ⅝-inch anchor rod having a breaking strength of 19,350 pounds was broken, but the anchor refused to yield. A list is also published showing a large number of telephone and electric companies that are using these anchors. They are also used by steam railways and interurban lines.

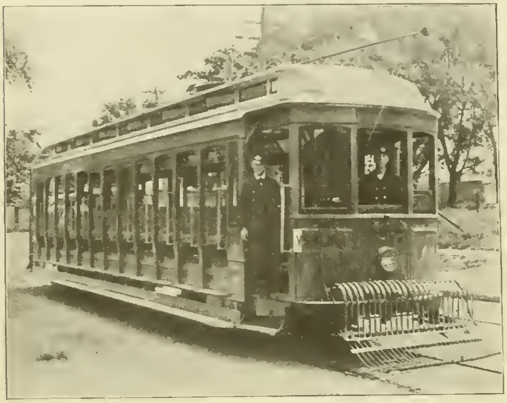
Standard Underground Cable Company, Westinghouse Building, Pittsburg.—Handbook No. 17 is a useful reference work for any one having to do with electrical installation. In addition to a price list of insulated wires, electric cables and accessories made by this company, there is an elaborate manual and code of directions for handling and insulating cable and wire of various types. Tables of weights and measures, melting point, specific gravity and relative conductivity of metals, electrical horse power and other information of value for reference is provided in pocketbook form. Price fifty cents to one dollar according to binding.

General Electric Company, Schenectady, N. Y.—This company has just issued a large number of circulars and flyers describing mercury arc rectifier battery charging panels, incandescent lamp bases for Edison lamps, motor starting rheostats with no-voltage release, and several new bulletins: No. 4443 describes the Sprague-General Electric multiple unit control for alternating and direct current operation; No. 4446, starting compensators for alternating current motors; No. 4447, low voltage three-phase generator and feeder panels; No. 4449, potential and synchronizing plug switches; No. 4450, parts of General Electric railway motors. Each of these bulletins is 8 by 10½ inches and has a perforated back for placing in file.

Watson-Stillman Company, 26 Cortlandt St., New York.—Catalogue No. 69 is devoted to hydraulic tools for steam and street railroads. It has 126 pages 6 by 9 inches and is compiled from an assortment of over 800 pages of printed matter describing the different hydraulic tools made by the company. This catalogue is intended to replace railroad catalogue No. 53 and street railroad catalogue No. 52 and shows only the standard sizes of tools made for railway work. The company will furnish sketches and blueprints covering special tools or will send other catalogues upon application. The tools described in this catalogue include all kinds of jacks, lifts, screw punches, rail benders, rail-bender blocks, crank pin presses, and fittings for same, wheel presses, straightening presses, testing pumps, packings, gauges, repair tools, etc., some of which have not been described in previous catalogues.

NEW FORM OF CONVERTIBLE CARS FOR SYRACUSE RAPID TRANSIT RAILWAY COMPANY.

The Syracuse Rapid Transit Railway Company has recently purchased from the G. C. Kuhlman Car Company of Cleveland a new form of convertible car, built under Brill patents. These cars will be operated on the main line in the city of Syracuse, running from the northern extremity of the city across town to Onondaga Valley, where the company's summer theater is located, a distance approximately of 6½ miles. This is a heavily traveled line and a five-minute service is maintained throughout the day; in the evening cars are run to the resort every two and a half minutes.



New Type of Convertible Car for Syracuse Rapid Transit Railway.

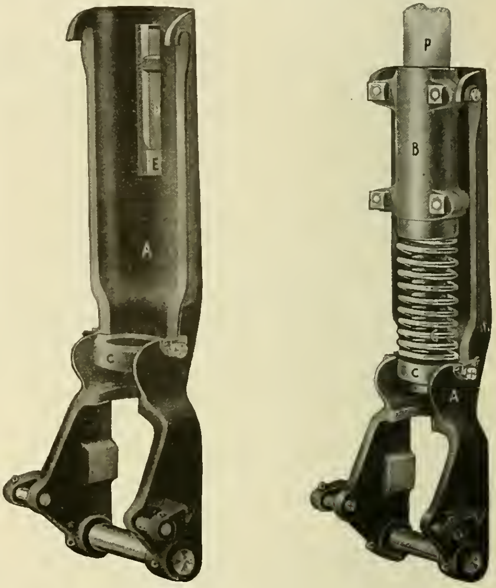
The cars are convertible on the one side only, as they are to be run only in one direction. Last year the Cleveland Electric Railway Company adopted a similar type of car built by the Kuhlman company. The cars for the two roads mentioned embody a seating arrangement which is a combination of longitudinal and transverse seats. The left side of the car, or the side opposite that which has the sliding sashes and panels, has the standard type of built-in panels and dropped window sashes; against this side are placed longitudinal seats in sections, accommodating three passengers each. The distance between the ends of the transverse seats and the cushions of the longitudinal seats is 33 inches; in other words, there is a gain of about 15 inches over the aisle width of a car with transverse seats on both sides. When the convertible side is opened, the longitudinal seats are swung into line with the transverse seats and securely connected thereto, forming continuous seats across the car and accommodating five passengers each. The seating capacity of the car, taking into consideration the seats across the doors, is 65 passengers.

The Brill grooveless post semi-convertible feature is employed, which includes a modification of the "Narragansett" type of sill step and in this latter respect the cars differ materially from those used in Cleveland. Instead of the step treads being composed of metal plates secured to the flange of the Z-bar sill and nearly all within the line of the posts, the new arrangement consists of step treads which fold up individually and on which the panels in their lowered position rest. This arrangement does away with the necessity of cover plates for the step openings when the car is closed and adds much to the appearance of the car. The curtains may be drawn entirely down to the floor when needed for protection against stormy weather and as the windows on the opposite side of the car are always available, the interior is well lighted, and on rainy days the interior of the car presents as comfortable an appearance as a standard closed car.

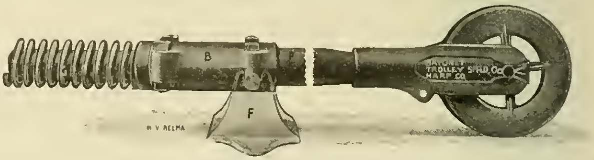
A novel feature consists of the water-board placed longitudinally along the side roof on the convertible or entrance side, including the part of the roof which extends over the platforms. One of the pipes which carries off the water from the trough formed by the water-board is placed beside the body corner post at the forward end of the car to be utilized as a grab handle; the other pipe at the rear of the car is used as a hood support. There are no doors in the vestibule at the forward end, but instead, a partition with sliding door extends diagonally across the platform from the vestibule corner post to the body door post at the center of the body end. The door at the body end is of the "semi-accelerator" type and the door at the rear end is of the same style; these doors are set close to the platform steps to facilitate ingress and egress. The grab handles on the side posts are turned backward as will be seen from the illustration, so arranged that passengers on alighting will only see the one at the left and are therefore made to face forward, thereby avoiding the most common cause for accidents.

The principal dimensions of the cars are as follows: Length over the end panels 35 feet 6 inches and over vestibules 45 feet; from the end panels over the vestibule (front end) 4 feet and at rear end 5 feet; width over the sills including plates 7 feet 11¼ inches; width over posts at belt 8 feet 2¾ inches; height from floor to ceiling 8 feet 6¼ inches, and from track over trolley board 12 feet· sweep of posts 1¾ inches; distance between centers of posts 2 feet 9 inches; side sills are 4¾x7¾ inches on the closed side and 2½x7¾ inches on the convertible side; end sills 4¾x7¾ inches; sill plates on the closed side 8x⅝ inches; on the convertible side 8x6x⅞ inches. Length of seats on convertible side 36 inches; movable seats measure 53 inches. The type of truck is the Brill 27-G; weight of car body is about 21,000 pounds; car and trucks without motors weighs about 33,000 pounds.

A DETACHABLE TROLLEY POLE.



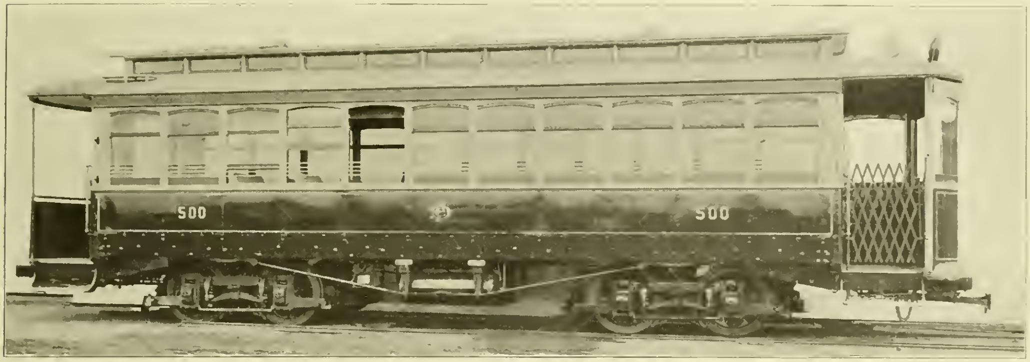
Details of Detachable Trolley Pole.



Bayonet Detachable Trolley Pole.

A new invention has recently been added to the line of time-saving decices of the Bayonet Trolley Harp Company, of Springfield, O., which is known as a detachable trolley pole clamp and arm. The device is very simply constructed, consisting of two principal parts, the arm (A) and pole clamp or base (B). The lower part of the arm (A) is variously designed so as to fit any style of base, but has a trough-like extension, defined by marginal flanges, and at the upper and lower end of this extension, and forming part of the flanges, are sets of hook-like projections oppositely directed toward each other. The lower set of projections receives the trunnions of an abutment collar (C). The upper set receives the studs or projections on either side of the clamp (B). This clamp is also provided with an extension or tail-piece which is designed to pass through the opening in the abutment collar (C) and forms a guide and support for the lock spring (G) which is coiled thereon and secured thereto by means of a spiral groove in another collar at the union of the tail-piece and clamp proper. When the pole clamp (B) is in working position the lock spring (G) rests against the abutment collar (C) and holds the clamp studs into engagement with the upper set of hook-like projections with a pressure of over 100 pounds. On the underside of the clamp (B) is a locking projection which extends through the slot in arm (A) and engages the spring safety latch (D). This safety latch is not a necessity, but a precaution in case of backing the trolley. The pole is removed by holding back the latch (D) and pressing the pole down and forward steadily until the clamp studs disengage the upper set of hook-like projections when the tail-piece of clamp (B) is withdrawn from the abutment collar (C). Reverse the operation and the pole is on again. It requires no tools whatever to remove or replace pole.

Not the least important is the means of lining up the pole, which is done in the car barn. The trunnion rack or frame (F) is placed on any plane of sufficient length to accommodate the pole fitted with harp and wheel. Place the clamp (B) in the rack with the studs in their bearings, then the pole with flanges of wheel resting on the other end of plane is laid in the clamp (B) and fastened with four bolts as in the ordinary way. It has been fully demonstrated that this method of lining up the wheel and pole insures a more perfect alignment than it is possible to get on top of the car.

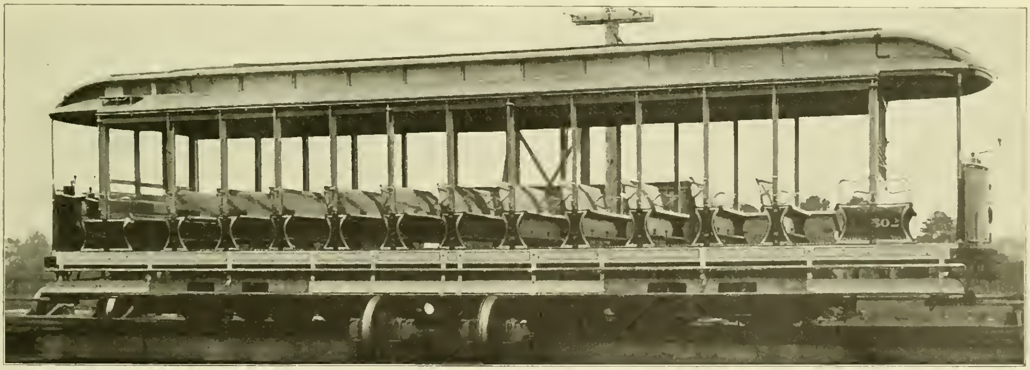


Steel-Sheathed, Semi-Convertible Car for City of Mexico.

As this alignment can be done in the car barn in five minutes' time and the poles exchanged on top of car in only one minute, every railroad man who has ever taken note of the time lost in renewing broken poles will consider this a most important invention in trolley equipment. The Bayonet Trolley Harp Company expects to give daily demonstrations at the Columbus convention of this new device.

ROLLING STOCK FOR THE CITY OF MEXICO.

The climate of the City of Mexico is exceedingly hard on cars and a special car is necessary to withstand the ravages of the intense heat and dry atmosphere. The most carefully seasoned wood will be subject to shrinkage in this climate, consequently the cars are built with straight sides faced with ⅛-inch steel; the ceilings are also of 1/32-inch rolled sheet steel instead of the usual veneer as the laminated section of the veneer become detached when subjected to the existing atmospheric conditions.



Double-Step Open Car for Worcester.

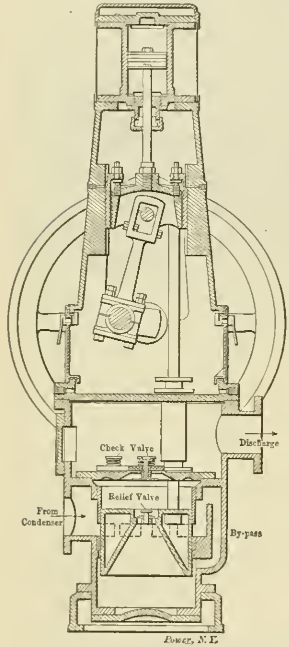
Practically the entire rolling stock for the City of Mexico has been built at the plants of the J. G. Brill Company and the American Car Company and the cars described below originated in the latter company's plant at Cleveland. The order called for eleven 30-foot 8-inch semi-convertible grooveless-post motor cars mounted on Brill 27-G1 trucks and seven trailer cars of precisely the same style and dimensions and also mounted on the Brill 27-G1 truck. In the City of Mexico, cars having longitudinal seats composed of wooden slats are for second class passenger service, those of the first class having the standard transverse seats of cane and it is to this latter class that the cars lately put on the road belong. The chief dimensions are: Length over vestibules including bumpers, 40 feet 10 inches; width over sills including plates, 8 feet 2 inches, and the latter dimensions apply to width over posts at belt; height from floor to ceiling is 8 feet 3⅛ inches and from track to under side of sills 2 feet 10¼ inches; from track to platform step, 17½ inches. The framing includes side sills, 4½x7¾ inches, center sills filled with I-beams 4¾x6 inches; end sills measure 4½x7½ inches; thickness of both corner and side posts is 3¼ inches; length of seats 36 inches, and width of aisle 22 inches; weight of car and trucks without motors 26,500 pounds. The cars are finished in cherry and the steel ceilings are painted to resemble veneer; numerous Brill specialties are employed throughout the car. A feature strongly in favor of this type of car is the metal stiles which prohibit any possibility of the sash warping or sticking, no matter what the climatic conditions may be.

DOUBLE-STEP OPEN CARS FOR WORCESTER.

Most open cars mounted on double trucks are necessarily restricted in width for clearance purposes and the way to overcome the difficulty is either to have the lower running board arranged to fold up when the car is in motion or else employ a double-step open car which takes up no more room than an ordinary single-step open car. In the case of the eight 15-bench double-truck open cars which the John Stephenson Company of Elizabeth have lately completed for the Worcester Consolidated Street Railway Company, the matter of restriction in width was not a vital question since the car adopted has ordinary non-folding double-steps which would be prohibitive to most roads on account of the extra width. The cars are mounted on the Brill 27-GE1 trucks having a wheel base of 4 feet 6 inches; wheel diameter 34 inches; axle diameter 5 inches. The length over end posts is 34 feet 2½ inches, and over crown pieces 42 feet 3½ inches; width over sills including sheathing 7 feet 4 inches, and over posts at belt 7 feet 9 inches; height from track to lower running board 18¼ inches; size of side sills 4½ inches x 8½ inches; thickness of corner posts 3⅝ inches; side posts 2¾ inches. The seats, which are of maple, reverse in the usual manner; the same material is used for the ceilings. "Dedenda" alarm gongs, signal bells and angle-iron bumpers are among the Brill specialties used on the cars. Attention is called to the steam car roof, which is not often seen with cars of this description.

MULLAN VERTICAL WET VACUUM PUMP.

One of the most important auxiliaries of the steam power plant is the so-called air pump. Unless the air pump is capable of good performance under all varying conditions of load it is not practicable to maintain a constant high vacuum in the condensers. Condenser vacuum pumps which are in fact water pumps constructed with three sets of valves, foot valves, bucket lift valves, and head valves, present the disadvantages of requiring relatively large clearance space above the buckets where re-evaporation occurs and cause a wasteful back pressure on the main unit in order to overcome the inertia of the water when forcing it through the foot valves; the engine back pressure needed to cause the foot valves of such pumps to operate increases as the pump speed increases because of the corresponding lessening of the time in which the foot valve must open and close.



Vertical Wet Vacuum Pump.

In the accompanying illustration is shown the Mullan vertical wet vacuum air pump which is designed to meet the most exacting requirements of either engine or turbine plants.

The water and air are dealt with mechanically, and foot and bucket valves are entirely superseded. Every lift of the bucket takes its due amount of the water, and increase of speed does not impair the efficiency of the pump. The pump has a single-acting water-packed bucket with a conical bottom having a central opening communicating with a small relief valve for taking care of any water which may be carried into the bottom of the cylinder by the grooves in the water-packed bucket. The suction chamber delivers the condensation and its entrained air through openings in the inner shell of the cylinder, above the top of the bucket, instead of at the bottom; as the bucket rises the motion is that of a "water hoist," rather than that of a pump in the ordinary sense of the word. The absence of foot valves to be lifted on the upstroke, or of bucket valves to be lifted on the down-stroke leaves the communication with the condenser perfectly free and open at all times, preventing the accumulation of back pressure. The air is ejected first; and the clearance space at the top of the stroke is made so small that nearly all of the water, as well, is ejected, thus giving practically no opportunity for air entrained in the water and expanding during the down stroke of the bucket to accumulate in the space at the top of the cylinder.

This pump is manufactured by the C. H. Wheeler Manufacturing Company, of Philadelphia.

THE GIBBS TICKET-COUNTING MACHINE.

An ingeniously designed machine specially adapted for counting street railway tickets and transfers is shown in the accompanying illustration. This device was invented and brought to its present stage of perfection by Mr. W. A. Gibbs, general manager of the Zanesville Railway Light & Power Company. The machine may be used in counting paper money, stamps, postal cards, tickets, transfers or any similar strips of paper or pasteboard that may be introduced into it. It is also designed so that, if desired, tickets or transfers after being counted can be punched or torn in two.

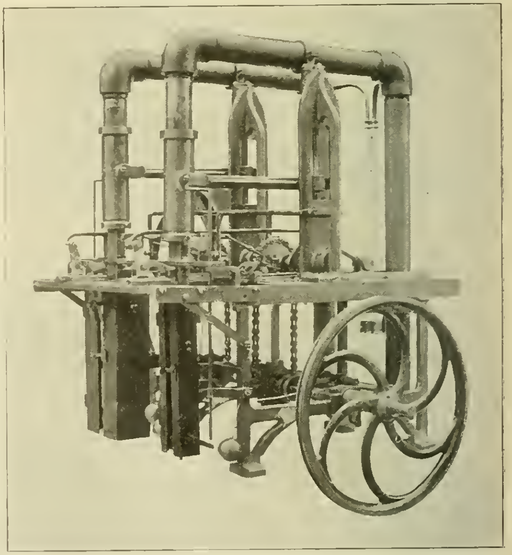
The method of operation includes the use of a vacuum. The large pipes shown in the illustration are connected to an exhaust fan or air pump which creates a suction in them. The dashpot shown on the front of the machine carries a square nozzle extending down into the ticket feed-box shown beneath the table of the machine. This nozzle is used for bringing the air suction into contact with the pack of tickets in the box below. The movable part of the dashpot is connected to a crank shaft in the machine by an arm extending back to the vertical shaft so that when the machine is driven the nozzle has an up-and-down reciprocating motion.

As a ticket is lifted off the top of the pack by the air suction it is carried through separators in order that two or more tickets may not be counted as one. Then when separated the single ticket is taken off the nozzle on the dashpot by a stripper, which is a sleeve fitting closely around the extension on the lower end of the dashpot. The stripper fits this end of the dashpot so closely that the air suction is maintained on the ticket. As the dashpot passes still higher the vacuum holds the ticket on the lower end of the stripper long enough to allow the carriage to pass in, get the ticket and carry it out.

The clamping attachment shown on the front of the machine is a gauging device so adjusted that should the tickets fall to separate they cannot be taken away from the front of the machine by the carriage, but are held in the same position as when lifted by the nozzle and are later carried down through the separators until only one ticket comes up, which will pass through the machine and be counted.

The fingers on the machine are so arranged that if a ticket is not taken off it drops through slots and the counting attachment does not register. This feature, the inability of the machine to register if a ticket does not pass through it, together with the attachment for preventing two tickets from passing through and being counted as one, should assure an accurate count. It is not necessary to stop the machine in order to insert tickets or transfers for counting, because the feed-box may be opened and as many tickets set in as it is desired to count at one time. The feed-box can be made of any length and as many as 3,000 tickets may be put in at one time. When a supply of tickets has been placed in the machine no further attention is required, as these tickets will all be counted one by one and as soon as the supply is exhausted, the counting will cease. It is estimated that one person can count 50,000 pieces per hour with this machine if they are inserted in packages of 500 each.

Even with the very small street and interurban systems the time of two or three people at least, is fully occupied in counting tickets and transfers. On the larger systems there are in proportion to the number of cars operated, still more tickets and transfers to be counted. For this reason it is necessary for some of the auditing departments of the larger properties to employ 50 or more people whose full time is occupied in counting tickets and transfers. In this method of counting the personal element enters, thus lessening the reliance that can be placed on the accuracy of the count. Such a ticket counting device, so constructed that it will neither register if a ticket does not pass through it, nor allow two tickets to enter the counting attachment at one time, should be a welcome addition to the equipment.



The Gibbs Ticket and Transfer Counting Machine.

The machine measures 16 inches in width, 23 inches in height over all, and 15 inches in depth. It is built up of sections 8 inches wide and as many sections can be supplied as desired. The machine is manufactured by the Gibbs' Counting Machine Company, Janesville, O.

Electric Railway Review

· DAILY EDITION ·

PUBLISHED BY THE WILSON COMPANY
at Columbus, O., in honor of the Annual Conventions of the American Street and Interurban Railway Association and of its allied associations of Accountants, Engineers, Claim Agents and Manufacturers

COLUMBUS: 83 North Third Street CHICAGO: 1600 Monadnock Block NEW YORK: 150 Nassau Street PITTSBURG: 510 Frick Building
Subscription Price, $1; Foreign, $3; Single Numbers, 10 cents.

VOL. XVI COLUMBUS, O., OCTOBER 15, 1906 No. 10a

Exhibit Hall Decorations.

The combined population of English speaking countries and of France aggregates possibly 150 millions and it is safe to say that nearly all of these look upon red, white and blue, as combined in the national flags of America, Great Britain and France, respectively, as being the most beautiful combination of colors possible. However, it is only in the flags that these colors are at their best and they are decidedly inferior for decorative purposes. When the committee of the Manufacturers' association requested the exhibitors "to adhere, as far as practicable, to a general color scheme, using the national colors, red, white and blue," the impossible was attempted if beauty and harmony were desired. We think the executive committee was to be congratulated upon recognizing the mistake, even at a late date and adopting green for the color of decorations in its own quarters at the Exhibit Halls, and that it was an error from the artistic standpoint, at least, to have the headquarters booths redecorated to conform to the original plan.

Paying for the Banquet.

One of the reforms instituted by the street railway association last year was the elimination of the banquet expense from the association "budget." Up to and including 1903 the banquet was a feature of each convention and constituted the largest item of expense, an extravagance, in fact, and one that ill could be afforded. Conditions at the St. Louis meeting in 1904 prevented holding the annual dinner, and last year at Philadelphia the banquet tickets were paid for by the individuals using them and not by the association. It has been suggested that the principal utility of a banquet is to afford that second opportunity for consideration for those who feel it necessary to follow the example of certain of the ancient Greeks, who, being of an eminently conservative mind, preferred to pass upon important matters twice, once when sober, lest they be lacking in discretion, and again under convivial conditions, lest they be lacking in enthusiasm. If this theory be correct, it follows that street railway men and their allies have no real need for a banquet anyhow.

The Beauties of Early Registration.

The early bird gets worms, and the man who registers at the offices of Secretary Swenson and Chairman Ellicott promptly this morning will get the early badges. It is a duty that every attendant at the conventions owes to others, to say nothing of the duty that he owes to himself, to give this matter immediate and serious attention. The successful execution of many of the arrangements for the entertainment and comfort of the convention host are dependent upon the prompt assignment of badges and the registration of the names for the official list of delegates and guests. This list is a work of considerable detail and difficulty, and each individual can contribute towards its early and accurate execution by registering promptly and exercising that patience which is always demanded when a crowd so large as will be at the Fair Grounds today and tomorrow has to be handled. The officers in charge of registration have provided an unusually large and efficient clerical force to take care of the work, and they need only the cooperation of those for whose interests they are working to produce early and satisfactory results.

Weather for the Conventions.

On Wednesday last, the weather man gave the officers of the several associations interested in this week's conventions, a severe shock. The ground in Columbus and vicinity was covered with snow, and there was a chill in the atmosphere that got into the marrow of those who were installing exhibits and who had charge of the convention arrangements generally. On Thursday, it was still cold, and under foot, something more than sloppy. On Friday the executive committee of the Manufacturers' association discussed weather all day with the representatives of the Columbus Board of Trade. On Saturday, the sun was shining, and there was a promise of surcease from sorrow for Mr. Pirrung and his associates, who were threatened with excommunication if a temporary heating apparatus were not installed in the buildings at the Fair Grounds, so that during convention week people near and far might not shiver and scold. Yesterday the weather man gave us an ideal October day, and all thought of natural gas heating apparatus was forgotten. We were assured by the weather manufacturers in this vicinity that all will be well; that if it does not rain or snow, if the sun will continue his smiles and if the thermometer does not experience a serious fall, we shall all be comfortable and enjoy weather as balmy as the most fastidious could desire. It is comforting to know, however, that as a safeguard, natural gas is piped to all the convention buildings at the Fair Grounds, and that an ample supply of hot air of a genuine brand may be turned on at any moment.

Work of the Week.

The work of the conventions during this week will be of especial importance, because the reorganized American Street and Interurban Railway Association is on trial. For three years earnest efforts have been made to effect a plan of organization that would enlist the sympathies of the electric railway companies of North America in a comprehensive endeavor to make the results accomplished by the association commensurate with the importance of the industry which it represents. The determination to adopt the plan finally agreed upon in Philadelphia was only made after most careful consideration of the effect on all the associations interested. It was agreed by all that the departmental associations had fully demonstrated their utility, and one of the prime requisites of the reorganization was that the efficiency of the Accountants', the Engineering and the Claim Agents' associations should, in no wise, be lessened. Nevertheless, it was apparent that development along the lines which had been followed prior to 1904 would inevitably result in too great a number of independent associations. The present organization is well adapted to secure harmonious action among the various affiliated associations and the parent organization. The Executive Committee which had have had the direction of the work for the past year and the preparation for the Columbus conventions have done their work well and when the results are laid before the delegates who attend the meetings this week, the responsibility of the association's officers, so far as this year's work is concerned, is at an end. There will remain much to be done, but it is for the member to do.

Don't Kick. Make Yourself at Home.

Doubtless if each visitor at this week's conventions had been in position to choose in the matter of hotel accommodations without regard to others or to the inevitable limitations of hotel capacity, he would have a room with bath, accompanied by all the comforts of home. There was a good deal of lamentation and muttering, much evidence of irritation and some slightly disguised profanity in the hotel corridors, on the streets and at the Fair Grounds yesterday by those who felt that they "had got the worst of it" in the assignment of rooms. There will be more of such signs of displeasure this morning when convention people begin to arrive in large numbers. All of this is natural and in a way it is perfectly proper. Certainly it is not unexpected. Yet it is useless and unwarranted, in view of the facts. There is no place on the planet ideally located or equipped to take care of conventions the size of these. Saratoga Springs or Atlantic City has the hotels but neither has the exhibit accommodations. Nothing better so far as arrangement of floor space, shelter and light could be desired for exhibit purposes than the splendid group of commodious buildings at the Ohio State Fair ground. But Columbus has not the hotel facilities. If she had them, her hotel business would be bankrupt. Hotels to meet the bath-room tastes and the Turkish rug appetites of the convention crowd cannot exist upon our patronage alone. It is as easy as it is truthful to say that Columbus is a blanked poor place to hold these conventions; but it is difficult if not impossible to point on the map to any other place that will not be open to other objections equally serious. The fact that all of us who are sleeping two in a room without closet, bath or other marks of highly civilized existence should bear in mind is that Columbus people have met the situation with earnestness, good faith and vigor. They have done the best they could and in many respects they have gone far on the road of meeting unreasonable demands. Let's be reasonable, make the best of it, quit kicking and make ourselves comfortably at home in Columbus.

What the Associations Offer.

As suggested in Convention Bulletin No. 6, which has just been issued by Secretary Swenson, there can hardly be stronger proof of the value of the American Street and Interurban Railway Association to every railway company than is given by the names of the many prominent men who compose the committees which are enumerated in the list. The work which the prominence of these names assures within the first few years of the existence of the reorganized association, should be of much more value to every member company than all that the association costs it. The point is made that it is easy for any reader of the bulletin to select a committee whose work promises to be more important to him than any other in the solution of the problems which his work continually involves and to select the work of such committee for special consideration. Bearing in mind this fact, the question whether the closer interest in, and knowledge of, the work performed by the various committees is not liable to be of great value to each individual in railway service is a pertinent one. It is promised, and there is every indication that the promise will be fulfilled, that the convention of 1906 will do more work than has been done at any previous meeting, and the work has been so arranged that every one in attendance may derive the greatest possible benefit from it. The bulletin has been sent to every street and interurban railway company in the United States with the view of increasing the interest of the companies already members and of attracting the attention of those who are not already members to the benefits that would accrue to them from joining the association. As a piece of missionary work the bulletin is admirably adapted to serve its purpose.

CONCRETE-STEEL IN ELECTRIC RAILWAY WORK.

Nothing is more significant of progress at the present time in the field of engineering construction then the rapidly increasing use of concrete-steel in all kinds of stationary structures. For many years the study of concrete has been a highly specialized branch of civil engineering and the reinforcement of this valuable yet inexpensive material with steel rods of various shapes, wire netting and its like represent nothing new in conception; but within the last few years great advances have been made in the methods of applying concrete-steel, and in the determination of the resistance of different designs to the stresses and strains imposed by severe practical service. Electric railways are gradually coming to appreciate the qualities of reinforced concrete, as the increasing number of car houses, power plants, shops, bridges, retaining walls, coal pockets and substations built of this material shows.

It would be a mistake to assume that wood, brick, steel and ordinary stone are no longer suitable for building materials because of the ectnomy and speed of construction possible with concrete-steel. Local conditions must be pretty carefully settled before a wise choice can be made. Wood may be the cheapest and best material for a hydro-electric power house built in a lumber section, provided the foundations are built of masonry or brick. Its life is bound to be short in comparison with the geological permanence of a concrete-steel structure, but the first cost may be sufficiently low to distance all other materials when fixed exchange and maintenance are computed. In case a plant has to be designed with long spans in its girders and beams, steel frame construction with brick or stone walls may be the most economical. Structures of this kind stood the ravages of fire and earthquake at San Francisco surprisingly well, when all the conditions are considered. But when all is said in favor of these competitive methods, the fact remains that for a wide range of adaptable service, concrete-steel has no superiors and few equals. The tendency of union labor to enter into costly strikes, the increasing demands of organized masons and other skilled laborers for shorter hours and higher wages, the inability of the great steel manufacturers to make quick deliveries of structural members at anything short of prohibitive prices, the growing scarcity of good timber and the growing requirements for reduced fire hazards—these considerations, coupled with the extraordinary speed of construction possible with concrete-steel, render it almost a necessity in rapid building operations. There is no industry where time is of greater value than in the transportation field—all the material progress of the age, in the last analysis, is directed toward the saving of time in some form or other by eliminated expense of labor and material—and in electric railway work the importance of being able to complete new facilities quickly without undue cost, can scarcely be overestimated. Even where decorative construction is desired, concrete-steel, in the light of recent knowledge lends itself admirably to the work. A broad field of usefulness for this material is now opening in the ornamentation of street railway parks, and some of the bridges built in this way compare favorably in appearance and permanent beauty with the celebrated creations of continental engineers.

It is beyond the scope of these comments to emphasize in detail the importance of expert design and trained supervision in concrete-steel construction. Experience counts heavily in this work and any electric railway which employs mediocre or inferior talent in the designs of its reinforced concrete car houses, shops or power plants or which does not see to it that the construction work in the field is superintended by a man of guaranteed ability, lays itself open to the most disastrous possibilities of failure, loss of life and financial setback. It is true that unskilled labor is a prime factor in successful ferro-concrete work, but it is absolutely essential that skilled supervision of the material used and the methods employed be constantly on the ground. The best consulting advice is none too good in concrete-steel application. When a reliable contract can be let on the basis of from eight to ten days' erection per story of a reinforced concrete building, it is clear that hap-hazard, rule-of-thumb and experimental methods must be barred out.

Touching briefly upon the constructional advantages of concrete-steel, it is primarily more flexible than any other material. The concrete block, plain or reinforced, must, of course, be included in many of the particulars. By the use of suitable wooden forms there is no limit to the structural shapes that can be produced. Busbar compartments, switch cells, switch board galleries, floors and foundations of concrete-steel are so much thinner than if composed of other materials that the saving in space is a valuable gain. Any one who has seen a modern concrete-steel power house must have been struck with the amount of window space permitted by the thin walls and columns. In same instances the machinery receives almost as much natural light as though it were located in the open. It is fair to say that in most cases a gain of at least 20 per cent in the cost of construction is possible by the use of concrete-steel in comparison with steel frame and brick structures, and in many localities it competes favorably with mill construction. We have already pointed out the reduced hazard which reinforced concrete insures. The monolithic nature of the material renders it particularly free from vibration effects. The essence of good design is, of course, to adapt the material to its purpose in as thin and light masses as are consistent with a decent factor of safety. Too much stress cannot be laid upon the necessity of designing the reinforcement to take the tensile stresses in the material, leaving the concrete to receive the compression stresses.

An electric road which adopts concrete-steel construction in anything but the smallest work will find it profitable to use steam-driven or electric hoists, cableways, gravity chutes, power-driven mixers, derricks and similar labor-saving appliances in carrying out the job. If the work is done under contract, the methods which the contractor proposes to use will bear carefull consideration. It is often the case that the cost of the wooden forms and of centering the reinforcement is 40 or 50 per cent of the total cost of a concrete-steel structure. Hence the importance of planning the form work so that the company's regular shop organization of labor and machinery can construct it and the wisdom of fabricating the forms by clamps and bolts instead of by nails. In the construction of a large dam the forms may weigh close to 1,000 pounds a piece and the importance of facilitating removal as well as erection, need not be dwelt upon at length. The adoption of concrete-steel introduces responsibilities in the securing of economy which deserve the most careful attention of the engineer in charge for the railway company, but the results are worth all that they cost.

What was last year an innovation in convention facilities appears this year to have become a necessity. An independent exchange telephone service has been installed at the Fair Grounds giving independent telephones at every exhibit. The committee has arranged with the local passenger association to establish a bureau of information where doubts regarding time-tables, etc., can be straightened out; the Columbus Railway & Light Company will furnish current at actual cost—direct current at 500 volts and 60-cycle alternating current at 110 and 220 volts; telegraph service and a postoffice have also been established at the grounds.

CONVENTIONALITIES

Register early and get your badge.

Sawdust is far preferable to the other kind.

Registration booths will be open from 9 a. m. to 6 p. m during all the days of the conventions.

Mr. Charles Remelius, master mechanic of the Public Service Corporation of New Jersey, arrived yesterday afternoon to attend the conventions.

Mr. W. E. Harrington, of J. G. White & Co., arrived from New York on the Pennsylvania yesterday afternoon. He is staying at the Southern hotel.

Mr. E. E. Potter, superintendent and purchasing agent of the Dartmouth & Westport Street Railway is at the Chittenden accompanied by Mrs. Potter.

Exhibitors should take special notice that the floors in the buildings are solid earth and that no nails, screws or bolts will be permitted to be driven in them.

The United Railways & Electric Company, Baltimore, are represented at the convention by Messrs. N. E. Stubbs, auditor, and H. H. Adams, superintendent of the shops.

A ladies' retiring room, with maids in attendance, has been arranged in the Administration building, the entrance to which is from the west end of Building No. 2.

Wisconsin is now having its day. Why? Because no animals except "badgers" will be admitted to participate in the present bench shows at the Ohio State Fair Grounds.

The Westinghouse interests have seen Heinz and his 57 varieties and raised him four large ones. There are 61 representatives of the Westinghouse companies in attendance at the conventions

Presumably in honor of the convention and in order to be in keeping with the traditions, it is observed that even the sawdust distributors in the exhibit halls run their wheelbarrows with a trailer.

Mr. S. L. Rhoades, president of the Claim Agents' Association, is among those who registered at the Southern on Sunday. Mr. Rhoades is chief claim agent of the Philadelphia Rapid Transit Company.

Second Vice-President J. S. Doyle, of the Engineering association, who is superintendent of the car equipment of the Interborough Rapid Transit Company, was a Sunday afternoon arrival at the Southern.

Mr. John R. Graham, president of the Lewiston Brunswick & Bath Street Railway, and president and general manager of the Bangor Railway & Electric Company is at the Hartman accompanied by Mrs. Graham.

The Boston and other representatives from the Massachusetts railway companies will arrive in this city on the New York Special at 7 o'clock this morning. They left Boston early yesterday forenoon.

Mr. Charles C. Peirce, vice-president of the Manufacturers' association, and manager of the railway department of the General Electric Company, Boston office, was meeting old friends at the Southern on Sunday.

The registration for the Claim Agents' association will be at the Fair Grounds, where Secretary Davis will make his headquarters. President Rhoades will be at the Southern but there will be no registration at the hotel.

The American Street and Interurban Railway Engineering Association has designated the following gentlemen as its local convention committee: E. C. Ackerman, engineer of maintenance of way, Columbus Railway & Light Company, chairman; L. C. Bradley, superintendent Scioto Valley Traction Company; W. H. Evans, master mechanic Indianapolis Traction & Terminal Company; W. P. Jackson, master mechanic Columbus, London & Springfield Railway Company, Columbus; Burr S. Watters, assistant engineer of way, Columbus Railway & Light Company, and Prof. E. H. Hitchcock, Ohio State University.

Mr. E. C. Spring, general superintendent of the Dayton, Covington & Piqua Traction Company, was expected to arrive in the convention city at midnight last night. He, with a party, is traveling in the private car "Overlook."

Mr. Charles J. Mayer, of Philadelphia, and Mr. J. N. Porter, Mr. Max A. Berg and Mr. J. V. E. Titus, of Chicago, are here looking after the interests of the Electric Service Supplies Company. They are all located at the Southern.

Mr. James Todd, president of the Sterling Varnish Company, will make the trip from Pittsburg to the convention in his automobile, leaving Tuesday morning. It is expected that a party of railroad friends will accompany him.

Secretary Ben Harmon of the c-o-n-v-e-n-t-i-o-n-s c-o-m-m-i-t-t-e-e of the Columbus Board of Trade is the professional target for pistol practice in Columbus this week. He is the man that people think assigned the rooms at the hotels.

Take any car with a sign reading "This Car to Street Railway Conventions and Exhibits—Fair Grounds," and let the conductor see your badge. The Columbus Railway & Light Company does the rest. The cars will be found on High street.

Mr. S. Walter Mower, general manager of the Southwestern Railway Company of London, Ontario, and secretary and treasurer of the Engineering association, was one of the early Sunday arrivals and is registered at the Southern hotel.

Mr. John J. Lane, secretatry of the New England Street Railway Club, Boston, Mass., was the guest of Mr. E. C. Spring at West Milton, Ohio, yesterday. He will, after Monday morning, be a regular attendant at the convention grounds.

Mr. H. A. Nicholl, general manager of the Indian Union Traction Company, Anderson, Ind., and party is scheduled to reach Columbus in his private car "Martha," this morning. The car is coming by way of Muncie, Union City and Dayton.

For the benefit of those who have not been assigned definite hotel accommodations the Columbus Board of Trade has provided an information bureau at the Southern Hotel in charge of Miss M. P. Nye, and all hotel assignments will be made through this bureau.

Members of the Claim Agents' association should take notice that President Rhoades will be at the Southern Hotel this morning for the purpose of meeting members. Secretary Davis will be at the Fair Grounds to register members of that association and deliver badges.

Business engagements prevented President Ely of the American association, from reaching Columbus as early as he had expected. He will arrive this morning, however, in good season to fulfill his promise to address the Engineering association at its opening meeting.

The Scioto Valley Traction Company extends the courtesies of the road to members of the associations. Members desiring to avail themselves of the invitation will be supplied with tickets on application to the ticket office, corner of Third and Main streets and showing badges.

Mr. F. J. Stout, general manager of the Lake Shore Electric Railway Company, will arrive here from the north in the private car "Josephine," today. A number of well known railway men from the northern part of the state ar accompanying Mr. Stout in the journey to Columbus.

Mr. Fred G. Simmons, superintendent of construction and Maintenance of the Milwaukee Electric Railway & Light Company, and first vice-president of the Engineering Association, is attending the convention with Mrs. Simmons. They are staying at the Southern. Mr. Simmons will be remembered by many readers of the "Review" as the author of an article on "Public Versus Private Ownership of Public Utilities," which appeared in the September issue.

Mr. Howard F. Grant, manager of the Seattle (Wash.) Electric Company, who has been in Boston, is expected to arrive on the special over the New York Central this morning, and will make his headquarters at the Southern hotel. Mr. Grant will be accompanied by his daughter.

An indication of the interest the business houses of Columbus have in the convention is shown in a display exhibited as a sign on High street near the Neil house. It consists of a miniature street car of the type corresponding to the new equipment of the Columbus Railway & Light Company.

The Hons. Charles Cossins Peirce and Edwin Hennery Baker are rooming together in a half-grown room at the Southern. They have a private bath with a valet, a trained nurse and a watchman in attendance. There was a good deal of trouble in that room yesterday morning just before breakfast.

One of the arrivals on Sunday for the sessions of the Engineering association was Martin White, superintendent of maintenance of way of the Public Service Corporation, Newark, N. J. Mr. White is accompanied by M. R. Boylan, general auditor of the railway department of the Public Service Corporation.

Mr. John I. Beggs, of Milwaukee, first vice-president of the American Street & Interurban Railway Association, and president of the Milwaukee Electric Railway & Light Company and the United Railways of St. Louis, left Milwaukee Sunday evening and is expected to be with us bright and early this morning.

Delegates to the Engineering association meeting are earnestly requested to study the map of the exhibit halls, so that they will know how to find the meeting place, and when they have the necessary knowledge, they are urged to make every effort to arrive there promptly at ten o'clock, when the meeting is to be called to order.

The dislocated orthography of a sign painter was in emphatic evidence at a booth in one of the exhibit halls on Friday, when a passerby, with a critical eye, discovered the artist writing a sign, in which were used the words, "Single phrase equipment." A few words from the critic put a different phase on the lettering.

An especially enjoyable entertainment for the ladies of the conventions is promised in the song recital scheduled for Tuesday afternoon from 2:30 to 4:30 at the Arlington Country Club. Mr. and Mrs. Amos W. Sharp have kindly volunteered for the entertainment. The regulation badge will be the only ticket of admission required.

For the benefit of the numerous attendants upon the conventions who are strangers in Columbus it should be made plain that the sign "High and Long," which appears upon some of the street cars is not merely descriptive of the car. In fact, the real object of the company is to designate certain streets upon which the said cars run.

One hundred and ten thousand square feet of exhibit space sounds large when considered as an abstract proposition, but it is fully occupied. It is perhaps of interest in this connection to note that at the Atlantic City conventions of the Master Car Builders' and Master Mechanics' associations in June last, 58,000 square feet of space were occupied.

The following bit of eulogy seems to hit the spot with truth and precision: "President McGraw rivals Emperor William in versatility and in the success he has attained in the many fields where it was necessary for him to exercise his activities in preparing for Columbus, Secretary Keegan has been a second Bismarck in carrying out with an iron hand the policy of his chief, especially in the matter of colors. Mr. Hequembourg, the director of exhibits, has been a veritable Von Moltke in the careful preparation of detailed plans of campaign and in carrying them to a successful conclusion, while Mr. Pirrung has been truly Napoleonic in his method of meeting emergencies." That ought to do for both the Irish and the Dutch.

The first badges distributed for the conventions appeared yesterday morning. They were immaculately white, and the button bore a large interrogation mark, with the words "Ask Us." They were worn by representatives of the Columbus Board of Trade, and they mean just what they say: Ask the board of trade for anything that you want.

The informal reunion and dinner of the Engineering association which had been scheduled for the evening of Tuesday, at 8 o'clock, has been abandoned, as it was felt by the executive committee of the engineering association that this dinner might interfer to an undesirable extent with the other evening arrangements which have been provided for the week.

Mr. Daniel M. Brady, president of the Brady Barss Company of New York, who was president of the Manufacturers' association last year, arrived on the Pennsylvania train yesterday afternoon, and was a conspicuous figure at an impromptu reception accorded him by many of his friends whom he met at the Manufacturers' association booth yesterday afternoon.

Although many of the convention delegates were informed on their arrival that they could not get to their rooms at once but must wait to give the present occupant time to vacate, most of them seemed to appreciate the conditions and were cheerful about it. As for the other fellows who found Columbus too small for them their feelings we are unable to describe.

Among its other varied duties, it is announced that the registration bureau will receive applications for associate membership in the American Street and Interurban Railway Association. This service is all the more admirable that there is no admission fee connected with the transaction. Other arrangements may be made with reference to the annual dues of five dollars.

Mr. H. Wallerstedt has resigned as engineer of car equipment for the Interborough Rapid Transit Company, of New York City, effective November 1, and will join the engineering staff of Ford, Bacon & Davis, of New York. It is greatly to be regretted that Mr. Wallerstedt's personal business, incident to this change, will prevent him from attending the conventions.

Mr. Evert Jansen Wendell, who will appear in the vaudeville performance of Friday evening, is a Harvard man, who is well known for his intense loyalty to his alma mater. Mr. Wendell also has the distinction of being a Shakesperian scholar and of owning probably one of the finest Shakesperian collections in the world. He was the largest individual purchaser at the sale of the late Augustin Daly's collection.

The sudden drop in temperature last week compelled many railway companies, operating a city system in the central states, to run out their winter cars to replace the summer equipment then in use. The Columbus Railway & Light Company was one of the companies thus affected. This company has 60 cars which it dismounts in making the change from summer to winter equipment.

Under joint arrangement between the American Telephone Company and the Central Union Telephone Company, the use of the Bell lines for long distance telephoning will be extended on a complimentary basis to all members of the several associations after 6:00 p. m. during the period that the conventions are in session. This courtesy is a mark of the enterprise of the telephone companies and is, doubtless, so far as it has a business motive, for the purpose of extending the popularity of long distance telephonic communication. This free service may be had at any of the pay stations of the Central Union company, where there are attendants in charge. These stations are located at the Chittenden, the Neil and the Southern, at No. 8 High street, and at the east end of building number 2 at the Fair Grounds.

Admirable arrangements appear to have been made for the benefit of exhibitors and in making it easy for them to get their exhibits into and out of Columbus. A feature of especial benefit consists in the arrangement made with the Big Four railroad by which special tracks are run into the Fair Grounds. The work has been in charge of Mr. K. D. Hequembourg as director of exhibits and assistant to Secretary Keegan, who has direct charge of all exhibits and details.

In honor of the American Street & Interurban Railway Association the lamps in the arches used in lighting High street have been arranged in colors of red, white and blue to conform with the general color scheme suggested for decorating the convention halls. The work or arranging the lamps was no small task as it required the changing of 50 lamps on each of the 25 arches in use. The work was done under the supervision of the Columbus Railway & Light Company.

The executive committee of the American Street and Interurban Railway Engineering Association met at the Great Southern hotel at 4 o'clock yesterday afternoon to consider the matters requiring its attention before the opening of the conventions. The members of the committee present, besides H. H. Adams, president, and S. Walter Mower, secretary, were F. G. Simmons, Milwaukee; J. S. Doyle, New York; Paul Winsor, Boston, and Fred N. Bushnell, Providence.

We are assured that the rules in effect at previous meetings as regards members' and guests' badges will be rigidly enforced during the present conventions. Only those having such badges or special admission tickets issued by the executive committee and properly endorsed will be admitted to the entertainments. In view of the efforts of the committee to make this feature of the conventions a pronounced success all necessary assistance and encouragement in enforcing the regulations should be afforded.

The visitor will observe that an American flag, fluttering in the breezes of an energetic electric fan, stands at the masthead of the room-clerk's desk of the Chittenden hotel. One day a visitor from New York stood in the rotunda and marveled at the flag. He wondered what its significance was. He inquired but got no satisfaction. After careful thought, he announced it as his conclusion that the American flag floated in that artificial breeze for the purpose of indicating that the Chittenden was an American plan hotel.

Those who have taken advantage of the certificate plan and obtained certificates when their tickets were purchased should not fail to remember to have their certificates with the proper clerk at the registration bureau for validation. This should be done at the time of registration. It will be held until required for the purchase of the return ticket. Tickets for the return journey will be sold by the ticket agent at Columbus, at one-third the first-class limited fare, only to those holding certificates signed by the ticket agent at point where through ticket to place of meeting was purchased, countersigned by the secretary of the American Street & Interurban Railway Association certifying that the holder has been in regular attendance at the meeting, and certified by the special agent of the lines of the railway association. Tickets for return journey will be furnished only on certificates procured not sooner than Thursday, October 11 (except that when meetings are held at distant points to which the authorized transit limit is more than three days, the authorized transit limit will govern), nor later than Wednesday, October 17, and will be available for continuous passage only, no stop-over privileges being allowed. Certificates will not be honored for return trip if presented later than Tuesday, October 23. The special agent at time of validation will collect from the holder of each certificate a fee of twenty-five cents. No refund of fare can be expected because of failure of the parties to obtain certificates or to have them properly validated by the special agent, who will be in attendance at the registration booth during the convention days only.

Supply men began gathering in Columbus in the early part of last week and since that time nearly every train arriving has added a few to the list. Several delegations of railroad men have arrived from distant points. The first special cars carrying passengers for the convention reached here on train No. 19 on the Pennsylvania railroad from the East. The Pennsylvania train from Chicago and the West, which is due in Columbus at 7 a. m. this morning will bring a large delegation of railway men. Train No. 28 of the Pennsylvania, due here from St. Louis at 8:40 this morning, will also bring in a large number of men from the Southwest.

The New York and New England delegates who were to start via the New York Central by special train, according to a special telegram sent from Utica by our representative, were on the way at about 9 o'clock last night. The number in the party is fully up to expectations, and if the train is on time, they will arrive in Columbus at 6:58 this morning.

Notwithstanding the announcement that no work was to be done upon exhibits after 6 p. m. on October 13, the various buildings devoted to the display of the products of members of the Manufacturers' association was on Sunday one of the busiest places in the State of Ohio. The erection of booths and the arrangements of exhibits are in an advanced state, but nevertheless there were many last things to be done and the degrees of progress yesterday morning ranked about in the relation of the numbers of the buildings.

It is of such importance to the smooth working of the miscellaneous features in connection with the convention that all attendants register promptly that the notice cannot be too often repeated. Members of each of the railway associations—American, Accountants' Engineering and Claim Agents'—will register at the association booth at the entrance to the exhibition halls. This will also be general headquarters. Members of the Manufacturers' association will register at a booth near the same place. "Help the committee by registering promptly." The registration booths are adjacent to that of the Electric Railway Review's.

Mr. C. N. Duffy has been appointed comptroller of the Milwaukee Electric Railway & Light Company, Milwaukee, Wis. Since Mr. Duffy resigned as secretary and auditor of the Chicago City Railway Company, he has been treasurer of the General Paper Company, and his many friends welcome his return to the street railway field, with which he has been actively identified for 20 years. From 1886, when Mr. Duffy became secretary and treasurer of the Union Railroad Company, St. Louis, until September 1, 1889, he was connected with the St. Louis street railway properties, controlled by the National Railway Company, as secretary and treasurer. In 1889 he became auditor of the Chicago City Railway Company. On September 1, 1903, Mr. Duffy was appointed comptroller of the Interurban Street Railway Company of New York and its allied companies, but returned to Chicago and resumed his position with the Chicago City Railway Company a few months later, where he has remained as secretary and auditor until February 17 last. Mr. Duffy was one of the organizers of the Accountants' association, and was chairman of the committee on Standard Classification of Accounts, and has presided at two of its annual conventions, at Niagara Falls in 1897 as vice-president, and at Kansas City in 1900 as president.

Two of the necessities of life are placed in juxtaposition and an excellent view of ourselves as others see us afforded by a paragraph in one of the local papers under the head "Restaurant and Paper." It is announced that "a special restaurant will be maintained on the grounds at which everything which can be obtained at a downtown restaurant will be found on the bill of fare," and in the next sentence it appears that "the daily paper with a staff of five reporters which will be issued by the Electrical Railway Review of Chicago will be a feature of the convention. This paper will contain a list of the delegates and their numbers, thus making it an easy task to find any of them. At the last convention this paper was published in French and English, but at the Columbus meeting only the vernacular will be used." It is devoutly hoped by the editors that each of the "five" varieties of reporter will stick to the vernacular in his copy, though along toward morning it is sometimes desirable to allow them to express their feelings orally in a language not universally understood. But the account in general reminds one of the learned biological professor's criticism of a definition of a lobster submitted to him for that purpose. The definition was: "Lobster: a fish with a red shell and that crawls sideways." The professor declared the definition an excellent one except that the lobster is not a fish, its shell is not red and it does not crawl sideways.

Meals at the Fair Grounds.

In view of the distance between the hotels and the Fair Grounds, it is altogether probable that many of the people in attendance at the conventions will remain at the grounds for luncheon. To meet this want, a restaurant has been established in a building just north of building No. 4, and a lunch room is located south of the main entrance of building No. 1. We are informed that ample facilities for meeting all eating-house requirements have been provided in these two places, and that the food will not only be first-class, but the prices extremely reasonable.

The Convention Halls.

The main auditorium for the meeting of the railway associations is in the West Central building, otherwise known as building No. 5. The interior has been very appropriately decorated, the color scheme being red, white and blue. The American flag very properly predominates in the decorator's scheme, and on the walls are hung well executed enlargements of photographs of the officers of the several associations. The meeting room is set off from the rest of the building by walls made of white bunting, which gives an effect of neatness, cleanliness and comfort, and is very attractive. The seating capacity of the hall is 600.

Meeting places for the auxiliary associations have been provided in the Administration building, so that when the arrangements call for these bodies to be in session at the same time that the American association is in session, all will be suitably accommodated. The meeting of the Accountants' association will be held in Grange hall, which is located upstairs at the east end of the East Central building, or building No. 2. The Engineering association will meet on Monday and Tuesday in the main auditorium, and on Wednesday afternoon in the large room on the third floor of the Administration building. The Claim Agents' association will convene on Monday and Tuesday on the third floor of the Administration building, and on Wednesday afternoon in the large room on the second floor of the same building.

The Dayton Manufacturing Company, of Dayton, O., has a working exhibition of the Simmons-Moore track sander. This device is controlled either by a compressed air line and valve or by a hand or foot lever. The mechanism is such that it will distribute sand under all conditions of temperature and moisture. Each time the sander is operated, the sand in the hopper is stirred by metal paddlearms which rotate through the sand. In addition, there is a small metal finger which at each operation reaches into an opening leading from the sand box and pokes the sand nearest the opening. A large number of the Simmons-Moore sanders are in use in and about Columbus. The Columbus Delaware & Marion Traction Company has all its cars equipped with this device.

SINGLE-PHASE EQUIPMENT FOR THE WASHINGTON BALTIMORE & ANNAPOLIS RAILWAY.

The Washington Baltimore & Annapolis Railway has finally adopted the single-phase system and has placed contracts for the entire electrical equipment required for this line. Some three years ago contracts were let for the construction of this road but, due to financial difficulties, the road was never built. It will be interesting to compare the electrical equipment proposed at that time with the present equipment, which represents the latest and most up-to-date practice in single-phase railway equipment.

In the former plans for single phase equipment between Baltimore and Washington it was proposed to use a trolley potential of 1000 volts, current being delivered at this voltage at a frequency of 16⅔ cycles per second. The present contract calls for a trolley potential of 6600 volts at a frequency of 25 cycles per second. On the cars a four-motor equipment was proposed, each motor having a capacity of 100 horsepower. The new car equipments will consist of quadruple GEA 603 motor equipments for direct or alternating currents, each motor having a capacity of 125 horsepower. While the first proposed motor equipments would have driven the cars at about forty miles per hour, the new equipments, totaling 500 horsepower, will enable express trains on the road to attain a speed on tangent level track of 60 miles per hour.

The details of the new road have been carefully worked out by the Roberts & Abbot Company, of Cleveland, O. Single-phase equipment was chosen only after the most careful engineering study had made it apparent that this system would prove most economical and best adapted to meet the special service conditions existing on this road.

Some 60 miles of road will be operated by the new company. The main line will be constructed between Baltimore and Washington, with a branch line from a point on the main line near Odenton, which will be known as Academy Junction, to Annapolis. Over the main line between Baltimore and Washington an express and local service will be established, express cars being operated under a 15-minute headway and making the run in 72 minutes. The roadbed will be double-tracked throughout, with sidings arranged at suitable intervals so that the locals may be sidetracked to enable the expresses to maintain schedules. The rolling stock equipment is to be very complete. Nineteen express cars, capable of making 60 miles per hour on a tangent level track will be operated. In addition two work-cars will be equipped, each sufficiently powerful to haul a train of five ordinary passenger coaches at 45 miles per hour, while four lower power cars will be used for local service. These last mentioned cars will run at a speed of 45 miles per hour. The express and work-cars will each be equipped with four GEA-603 125-horsepower alternating-current direct-current motor equipments with the Sprague-General Electric type M train control. The local cars will be similarly controlled but will be driven by two instead of four GEA-603 motors.

Power for the new road will be purchased from the Potomac Electric Company at Washington, D. C., and will be delivered by that company at 660 volts three-phase to a transformer substation located about three miles from Chesapeake Junction. In order to obtain a balanced load on the three-phase generators, the current as received at the substation will be changed from three-phase to two-phase by groups of two transformers connected three-phase on the 6600-volt primary side and two-phase on the secondary side. Half of the transformers will have the secondaries wound for 6600 volts and the other half for 33,000 volts. The 6600-volt windings will all be connected in parallel on the same phase supplying single-phase current to the trolley as far as Academy Junction. The 33,000-volt secondary windings will all be connected in multiple on the second phase, to the 33,000-volt transmission line, which will supply current to a stepdown substation located at Academy Junction. The Chesapeake Junction substation will contain seven 800 kilowatt water-cooled transformers, three with 33,000 volt secondaries and four with 6600-volt secondaries, one of the latter transformers forming a reserve.

At Academy Junction there will be four water-cooled transformers, 25 cycles, 800 kilowatts, reducing the single-phase 33,000-volt current of the transmission line to 6600-volt current suitable for delivery to the cars. These transformers will supply the Baltimore and the Annapolis sections of the line. The substation at Academy Junction will be located adjacent to the car barns. For greater safety in inspecting and handling the cars, all of the trolley circuits in the car barn will be arranged for 600-volt direct current, and for this purpose two 300-kilowatt motor-generator sets will be installed in the transformer substation changing the 6600-volt alternating current to 600 volts direct current. The motor end of these motor-generator sets will be connected direct to the trolley circuits, one phase being fed from the trolley coming from Chesapeake Junction and the other from the Academy Junction transformers. A feeder regulator will be placed in one phase so that the motor-generator sets will act as balances, permitting the Academy Junction transformers connected on phase B to feed into the trolley line supplied by the Chesapeake Junction transformers on phase A. In addition to acting as balancers and to supplying current to the cars in the barns, the motor-generator sets will also supply direct current to the motors in the repair shops located at this point.

Government regulations within the District of Columbia prohibit the use of the track return so that, within this section, the cars will be operated with a double trolley. This portion of the tracks, as well as that within the city of Baltimore, is at present operated by direct current, and the new cars are designed to operate on direct current over these sections of the line.

The present Washington Baltimore & Annapolis Railway Company which is constructing the line is quite distinct from the initial corporation. The new company, under the head of its president, Mr. George C. Bishop, has considerably broadened the former plans. Land has been purchased for a wider right-of-way along the route, and new bridges are being built so that the roadbed will be excellent. The engineering work is in charge of the Roberts & Abbott Engineering Company, of Cleveland, Ohio, and contracts have been placed with the General Electric Company for the complete electrical equipment. The construction and operation of this road will be watched with great interest, as it is one of the largest and most important installations of the single-phase railway system ever undertaken.

Philip Carey Manufacturing Company, Lockland, O., has recently completed a new office building designed by G. D. Crabbs, president of the company. Each window in the building has an automatic ventilator which is operated in connection with the transom over the window. The building has a hot-water heating system and the partitions are entirely of heavy glass which lessens the noise and yet affords generous lighting. There is a dining room in the building where the entire force from the office boy to the officials of the company are furnished food at prices in accordance with the salary of each. The basement has large vaults built of steel and concrete with automatic lifts communicating with each floor.

* * *

The Star Brass Works, of Kalamazoo, Mich., reports a very large increase in the sales of the "Kalamazoo" trolley wheels and harps, a satisfactory evidence of their popularity. These reliable goods may be seen at space 15, Section B, Building 1, and Mr. O. P. Johnson will be glad to shake hands and show you why the "Kalamazoo" is "First under the wire."

THE ASSOCIATIONS AND THEIR EXECUTIVE OFFICERS.

W. Caryl Ely.

This is the twenty-fifth annual meeting of the association which represents the street and interurban railways of North America, but it is the first meeting since the reorganization of the association has been effected and is of particular importance because of that. It will be an opportunity for comparing results and, we think there can be no question, of deciding that those who have had the direction of matters in recent years have discharged their duties faithfully and well. To Hon. W. Caryl Ely, more than any other one man, is due the credit for the success which has been attained. For three years Mr. Ely has worked actively in an effort to raise the standard of the association's work and the result evidences his ability, not only as an administrator, but in what, in a larger field, would be called constructive statesmanship. The association expressed its appreciation of Mr. Ely's first work in this direction by two re-elections to the presidency. This tribute to the ability of its president imposed also trying work, which could not but cause serious demands upon the time of so busy a man. His heart was in the work or he could not have undertaken it.

Bernard V. Swenson.

W. B. Brockway

Next to Mr. Ely, the success of the American association during the past year has depended upon the energy and activity of the secretary. Bearing in mind the fact that the American stands in an advisory capacity to the three departmental associations, all of which are highly technical in their work, it is apparent that the successful secretary of the parent body must be versatile as well as able. Professor Swenson's duties have included the organization and administration of a bureau for the collection and dissemination of information valuable to the industry represented by the association, and it has been highly important to have in the secretary's office a man whose technical education and experience were adapted to the requirements.

Elmer M. White.

The Accountants' association has a record in which all connected with it properly may take pride, but none has greater right to do so than President Brockway, who has put into this organization more of his own individuality and conscientious work than any other connected with it. The idea of organizing the street railway accountants originated with Mr. Brockway, although he was too modest to accept the credit for it. Elected Secretary at the meeting in Cleveland in March, 1897, Mr. Brockway was continued in that office, many re-elections being against his protest, until the convention of 1904. Mr. Brockway was elected president at the Philadelphia convention last year.

H. H. Adams.

On the retirement of Mr. Brockway from the secretaryship the association was very fortunate in being able to secure for this office Mr. Elmer M. White, who, as cashier of the Hartford Street Railway, had been very active in the work of the association. Shortly after his election as secretary, Mr. White removed from Hartford and was appointed assistant secretary and assistant treasurer of the Birmingham Railway, Light & Power Company, Birmingham, Ala.

S. Walter Mower.

The Engineering association, originally organized to represent only the electrical and mechanical engineering departments of the electric railways, enlarged its scope in 1904 to include also the civil engineering department as represented by the maintenance of way men. The association has been active in promoting the work of standardizing railway equipment and also in harmonizing the relations between engineering departments and the other department of the railways. The president of the Engineering association is Mr. H. H. Adams, superintendent of shops of the United Railways & Electric Company of Baltimore. The Engineering association from the beginning has consistently followed the policy of making its officers work and Mr. Adams has had to serve three years, having had a term each as third, second and first vice-president.

S. L. Rhoades.

Mr. S. Walter Mower was chosen secretary of the Engineering association when it organized in Cleveland, February 16, 1903, and at each annual meeting has been re-elected. Mr. Mower is general manager of the Southwestern Traction Company, London, Ont.

It is written "The last shall be first," and if the youngest of the associations, that of the Claim Agents, attains this position, it will be but giving proper recognition to the importance which the claim department holds in the company's organization. The president of the Claim Agents is Mr. S. L. Rhoades, chief claim agent of the Philadelphia Rapid Transit Company, and the secretary is Mr. B. B. Davis, claim agent of the Columbus (O.) Railway & Light Company. During the two years which this association has been active a great deal of good has been accomplished in the way of securing concerted action directed against fraudulent damage workers

Benjamin B. Davis.

The uninitiated, the man who has participated in conventions only as an observer, knows little of the blood sweat and the anxiety endured by the men who are either foolish enough or patriotic enough to plan and carry out a convention scheme. Those who write papers for presentation in the meeting, those who participate in committee work and prepare reports involving laborious investigation and those who come prepared to participate in discussions, all do indispensable work. In fact, there could be no conventions worth the while if this work were not done. That this work represents the intellectual side of a convention, but the work represented in the physical embodiment of the convention, the work that has to do with the exhibits, with the entertainment, and with the preliminary arrangements, is no less than the other a labor of love and it involves prodigous effort and many discouragements.

James H. McGraw.

George Keegan.

For several years the exhibits of railway apparatus and supplies which have been so prominent a feature of the annual gatherings of those interested in the street and interurban railway industry, have been of great magnitude, and really are comparable only with the displays to be found from time to time in great industrial expositions of an international character. The exhibit which is opened this morning at the Ohio State Fair Grounds surpasses in extent and in educational value those which have been made at former meetings of the associations. The work on each exhibit is an individual work of the manufacturer. The work of arranging for the display in its entirety has been performed by the executive committee of the American Street and Interurban Railway Manufacturers' Association. It is not too much to say that the exhibits at the Fair Grounds in Columbus have never been excelled in general appearance at any similar undertaking.

Kenneth D. Hequembourg.

The president of the Manufacturers' association and ex-officio chairman of its executive committee is Mr. James H. McGraw, whose ability and generalship have been displayed in a marked degree during the last year in his association labors. To Mr. McGraw belongs the exceptional distinction of being placed at the head of an organization of manufacturers, although in every day life he is a publisher and newspaper man. He became associated with the street railway business

Henry C. Pirrung.

through the publication of the Street Railway Journal in the days when the mule furnished the motive power. Mr. McGraw's growth and that of his several publications have kept pace with the wonderful growth of the street railway business.

R. G. Hutchins.

The chief, however, is never the whole show. It is hard for any man to succeed in a difficult position unless he is supported by able lieutenants and Mr. McGraw had such a lieutenant in Mr. George Keegan, the secretary of the Manufacturers' association. Mr. Keegan has a smile that is winning and a way that is wise. His portrait, presented herewith, does not indicate all of the smile nor much of the way. Mr. Keegan, for a number of years, has been associated in both Chicago and New York with Mr. Frank Hedley, now general manager of the Interborough Rapid Transit Company.

Another man who has done yeoman service in connection with the exhibits is Mr. K. D. Hequembourg, vice-president and general manager of the Franklin Car Heating Company of Syracuse, N. Y. In casting about for someone to keep the exhibitors straight, when the work of installing exhibits began, the committee was not long in selecting Mr. Hequembourg for the position and nothing that the committee has done has more clearly shown the rightness of its judgment than this appointment. Mr. Hequembourg started out with the official assurance that the duties of the director of exhibits would require about two hours of his time each day. The sequence of this assurance has been that since he began to perform these duties, they have required from twelve to eighteen hours of his time each day. Mr. Hequembourg was, for a number of years, with the American Locomotive Company. Then he became connected with the Consolidated Car Heating Company, and was later in charge of the car heating department of the Franklin Railway Supply Company of Franklin, Pa. The Franklin Car Heating Company, which was organized in the spring of the present year, was the outgrowth of this department. Mr. Hequembourg is the patentee and inventor of many of the features of the car heating system which is owned and manufactured by his company.

Joseph R. Ellicott.

Charles C. Peirce.

While the officers of the Manufacturers' association have been busy, certain citizens of Columbus have been busy, too. There is a poohbah in this town who is a gem of the brightest ray. He is a compound of 49½ per cent of energy and 50½ per cent of good nature, and his name is Pirrung. Mr. Henry C. Pirrung is indigenous to Columbus. His birthplace is about a block from the point at which now stands the the Southern hotel. The angels must have had a glad time when Pirrung came into the world, because the world has had a glad time in his immediate vicinity ever since his arrival on earth. In the business life of Columbus Mr. Pirrung fills an important place. He is vice-president of the Board of Trade. He is general manager of the Iroquois Hotel Company, which owns and controls the Chittenden, the Southern, the Neil and the Hartman hotels. He is general manager of the Capital City Dairy Company, whose chief claim to fame lies in the fact that it manufactures so-called "Purity Butterine." The butterine business or some similar oleaginous line of activity is a natural destiny for Pirrung, for even the best butterine would be smoother than it otherwise would be, on account of his connection with it. Mr. Pirrung has met the generous demands that have been made upon him from time to time in connection with the street railway conventions, with suavity, not to say gayety. His portrait, reproduced herewith, is in the nature of a libel, as his ears are not the most attractive part of his physiognomy. A front view is desirable, not to say necessary, in order to really see Pirrung.

E. H. Baker.

Mr. R. Grosvenor Hutchins, vice-president of the Jeffrey Manufacturing Company of Columbus, is chairman of the local reception committee He was president of the Board of Trade early in the present year and was largely instrumental in bringing the conventions to this city. In personal appearance, Mr. Hutchins is an Adonis and he has a most attractive personality. He is a Chesterfield in disposition, as well as in manners, and that he is a man of his word was amply proven in his dealings with the Manufacturers' committee. Throughout the last two months he has acceded to every request made upon him on

E. K. Stewart.

behalf of the exhibitors and the associations for accommodations which were to be provided for by the Board of Trade under the contract between that body and the Manufacturers' association. Mr. Hutchins has selected a list of representative men and women of Columbus to assist him in receiving their visitors. The personnel of this committee is given in another column.

There is more about a convention than exhibits, programmes and the like. The financial end always obtrudes itself in convention affairs, as in all other affairs of life. Mr. Joseph R. Ellicott, of the Westinghouse Traction Brake Company, is chairman of the finance committee, and to him falls the rather arduous undertaking of seeing that the money from the members of the Manufacturers' association and exhibitors is collected and turned over to the treasurer, Mr. E. H. Baker. With the collection agency functions of the finance committee's business, naturally joins the work of registering the representatives of the manufacturers. This work will begin early this morning at the booth of the Manufacturers' association, which is located immediately to the right of the main entrance of Building No. 1. The registration of the railway men comes under the jurisdiction of Mr. B. V. Swenson, secretary of the American Street and Interurban Railway Association. The booth at which the registration of railway delegates will take place is at the left of the main entrance of Building No. 1.

Mr. Ellicott is an old-timer in the railway supply business. He has been associated with the Westinghouse interests, representing both the Air Brake company and the Traction Brake company, for about five years. Prior to that he was manager of the Standard Air Brake Company, which was absorbed by the Westinghouse interests and is incorporated in the Westinghouse Traction Brake Company. Prior to his connection with the Standard Air Brake Company he was president of the General Agency Company, having previously represented the Griffin Car Wheel interests of both Buffalo and Chicago in the eastern territory.

Mr. E. H. Baker, of the Galena-Signal Oil Company, is treasurer of the Manufacturers' association and looks with an eagle eye upon the gold that comes in over Ellicott's counter. As Baker has to worry as much or more than anybody else about the relation between the income and the expenditures, he talks frequently of extravagance and of the inevitable deficit which follows in the wake of extravagance. He does it, however, in a very smooth way. Mr. Baker has been in the oil business all his life. It was in 1894 that he became associated with the Galena Oil Company, now the Galena-Signal Oil Company, and although small of stature and large of heart, he is a capital financier, and has done lots of hard work in connection with this convention.

Mr. Charles C. Peirce, vice-president of the Manufacturers' association and chairman of the entertainment committee, has had to bear the burden of providing the diversions for the idle hours and restful moments that may come to convention people during the present week. As he is a good entertainer himself, he is, without doubt, a most competent judge of the character of entertainments that will appear to those who attend the conventions. He is by no means a novice either in getting up entertainments or in entertaining. He has served these conventions and others for so many years that he is looked upon as a consulting engineer in matters pertaining to enjoyment and relaxation. Mr. Peirce has been, for 17 years, connected with the General Electric Company and its predecessors and has always clung to his New England environments. He has persistently refused any lure that might take him away from Boston, where for so long a time he has looked after the railway business of his company.

One of the most pleasing traditions in connection with the meetings of the street railway associations has been that which made the railway companies operating in the convention city the hosts of the conventions. As the industry has grown, the associations felt that the hospitality thus dispensed was too serious a burden for the companies of a single city to undertake, and accordingly, since 1902, the associations have endeavored, in so far as possible, to bear their own burdens. It is pleasing to note, however, that in the later conventions, the local railways have refused to divest themselves of a share of the responsibility in such matters, and many of the most agreeable entertainments are those for which they are the hosts. At Columbus the share of the railways in making things pleasant for the convention attendants, has been in charge of a committee, of which Mr. E. K. Stewart, vice-president and general manager of the Columbus Railway & Light Company, is chairman. Mr. Stewart's wide acquaintance and genial manner make this choice a very happy one.

CONVENTION PROGRAMME.

Monday, October 15.

Engineering Association.

10 00 A. M. to 12 30 P. M.

Convention called to Order.

Address of Welcome — E. C. Spring, General Manager, Dayton, Covington & Piqua Traction Company, West Milton, O.

Address — Hon. W. Caryl Ely, President American Street & Interurban Railway Association.

Address — Prof. Bernard V. Swenson, Secretary and Treasurer, American Street & Interurban Railway Association.

Reading of the Minutes of the Last Meeting.

Address of the President.

Annual Report of the Executive Committee.

Annual Report of the Secretary and Treasurer.

Appointment of Convention Committees.

2 00 P. M. to 5 00 P. M.

Report of Special Committees.

Report of Committee on Maintenance and Inspection of Electrical Equipments.

Report of Committee on Control Apparatus.

Paper — "Ballast," by Chas. H. Clark, Engineer Maintenance of Way, Cleveland Electric Railway Company, Cleveland, O.

Report of Committee on Way Matters.

Paper — "Ties, Poles, and Posts," by C. A. Alderman, Chief Engineer, Cincinnati Northern Traction Company, Cincinnati, Ohio.

Claim Agents' Association.

10 00 A. M. to 12 30 P. M.

Registration and Badges at Ohio State Fair Grounds.

Secretary Davis at Fair Grounds.

President Rhoades at Southern Hotel.

2 00 P. M. to 4 30 P. M.

Convention called to Order.

Address of Welcome — By B. B. Davis, Claim Agent, Columbus Railway & Light Company, Columbus, O.

Address — Hon. W. Caryl Ely, President, American Street & Interurban Railway Association.

Address — Prof. Bernard V. Swenson, Secretary, American Street & Interurban Railway Association.

Minutes of Last Meeting.

Address of the President.

Annual Report of the Executive Committee.

Annual Report of Secretary and Treasurer.

Appointment of Convention Committees.

Tuesday, October 16.

Accountants' Association.

10 00 A. M. to 12 30 P. M.

Convention Called to Order.

Address of Welcome — By P. V. Burington, Secretary, Columbus Railway & Light Company. Columbus, O.

Address — Hon. W. Caryl Ely, President American Street & Interurban Railway Association.

Address — Prof. Bernard V. Swenson, Secretary American Street & Interurban Railway Association.

Annual Address of President.

Annual Report of Executive Committee.

Annual Report of Secretary and Treasurer.

Appointment of Convention Committees.

2 00 P. M. to 5 00 P. M.

Paper —"The Accounting of Capital Expenditures," by P. S. Young, Comptroller, Public Service Corporation of New Jersey, Newark, N. J.

Question Box.

Convention Photograph.

Engineering Association.

10 00 A. M. to 12 30 P. M.

Report of the Committee on Standardization.

Paper —"Gas Engines," by Paul Winsor, Chief Engineer Motive Power and Rolling Stock, Boston Elevated Railway Company, Boston, Mass.

Paper —"Underground Cables," by H. G. Stott, Superintendent Motive Power, Interborough Rapid Transit Company, New York.

Discussion of the Question Box.

2 00 P. M. to 5 00 P. M.

Paper —"Relative Economy of Turbines and Engines at Various Percentages of Rating," by Walter Goodenough, Engineering department, Stone & Webster, Boston, Mass.

Paper —"Economy in Car Equipment, Weights, and Schedules," by E. H. Anderson, Schenectady, N. Y.

Discussion of the Question Box.

Claim Agents' Association.

10 00 A. M. to 12 30 P. M.

Paper —"Which is the Better Policy, Quick or Delayed Settlements?" by A. J. Farrell, Claim Agent, International Railway Company, Buffalo, New York.

Paper —"The Policy of the Claim Department Toward the Public," by W. F. Weh, Cleveland Electric Railway Company, Cleveland, Ohio.

2 00 P. M. to 4 30 P. M.

Paper —"The Claim Agent's Work of the Future," by C. Willis Hare, United Gas Improvement Company, Philadelphia, Pa.

Question Box.

Discussion —"The Relation of Statistical Bureaus to the Claim Agent's Work," by Russell A. Sears, C. S. S. Miller, Bayard P. Holmes, and William DeMilt Hooper.

Wednesday, October 17.

American Association.

10 00 A. M. to 12 30 P. M.

Convention Called to Order.

Address of Welcome by Robert Sheldon, President, Columbus Railway & Light Company; John Y. Bassell, Secretary, Columbus Board of Trade.

President's Address.

Report of Executive Committee.

Report of Secretary and Treasurer.

Address by Presidents of Affiliated and Allied Associations.

Announcements.

New Business.

2 00 P. M. to 4 30 P. M.

Reports of Committees.

(a) Membership.
(b) Compensation for Carrying Mail.
(c) Subjects.
(d) Car Wiring.
(e) Standardization of Equipment.
(f) Insurance.
(g) Promotion of Traffic.

Accountants' Association.

10 00 A. M. to 12 30 P. M.

Joint Meeting with American Association.

2 00 P. M. to 5 00 P. M.

Paper —"The Use of Curves in Statistics," by A. Stuart Pratt, General Auditor and Treasurer, Stone & Webster, Boston, Mass.

Report — Committee on Standard Classification of Accounts.

Election of Officers.

8 00 P. M.

Informal Reunion and Dinner.

Engineering Association.

10 00 A. M. to 12 30 P. M.

Joint Meeting with American Association.

2 00 P. M. to 5 00 P. M.

General Business.

Election of Officers.

Claim Agents' Association.

10 00 A. M. to 12 30 P. M.

Joint Meeting with American Association.

2 00 P. M. to 4 30 P. M.

Paper —"Methods of Management of Claim Departments," by H. C. Bradley, Adjuster, Chicago Union Traction Company, Chicago.

General Business.

Election of Officers.

Thursday, October 18.

American Association.

10 00 A. M. to 12 30 P. M. (Interurban Meeting)

Report of Committee on Heavy Electric Traction.

Paper —"Elevated Railways and their Bearing on Heavy Electric Traction," by H. M. Brinckerhoff, Consulting Engineer, New York.

Paper —"Electric Railways in Sparsely Settled Communities," by E. P. Roberts, of The Roberts & Abbott Company, Cleveland, O.

Paper —"Interurban Limited Trains," by Harrie P. Clegg, Dayton, O.

Paper —"Interurban Freight and Express," by E. C. Spring, General Manager, Dayton, Covington & Piqua Traction Company, West Milton, O.

Paper —"Tickets and Rates," by F. W. Coen, Secretary and Treasurer, Lake Shore Electric Railway Company, Cleveland, O.

Paper —"Some Notes on the Evolution of Electric Transportation," by Theodore Stebbins, Expert, National Civic Federation, Cohasset, Mass.

Appointment of Nominating Committee.

2 00 P. M. to 4 30 P. M. (Employes Meeting)

Report of Committee on Rules.

Paper —"Electric Railway Employes and the Young Men's Christian Association," by E. M. Willis, Railroad Secretary, International Committee of Y. M. C. A., New York.

Paper —"Selection of Trainmen," by C. E. Learned, Superintendent of Inspection, Boston Elevated Railway Company, Boston, Mass.

Paper —"Discipline of Trainmen," by F. W. Brooks, Assistant General Manager, Detroit United Railway, Detroit, Mich.

Paper —"Uniforms and Badges," by John R. McGivney, Purchasing Agent, New Orleans Railway & Light Company, New Orleans, La.

Accountants' Association.

10 00 A. M. to 12 30 P. M., 2 00 P. M. to 5 00 P. M.
(Executive Session)

Review—"Depreciation as Applicable to Electric Railways," by Robert N. Wallis, Treasurer, Fitchburg & Leominster Street Railway, Fitchburg, Mass.

To be followed by Discussion.

Installation of Officers.

Friday, October 19.

American Association.

10 00 A. M. to 12 30 P. M. (Executive Session)

Report of Committee on Municipal Ownership.

Report of Committee on Public Relations.

Paper—"Handling Public Complaints," by John A. Beeler, Vice-President and General Manager, Denver City Tramway Company, Denver, Col.

Paper—"Leaks Between Passenger and Treasurer," by A. H. Stanley, General Superintendent, Public Service Corporation of New Jersey, Newark. N. J.

2 00 P. M. to 4 30 P. M.

Report of Nominating Committee.

Election of Officers.

Resolutions.

Unfinished Business.

Adjournment.

CONVENTION COMMITTEES.

Local Reception Committee.

R. G. Hutchins, chairman.
Mrs. R. G. Hutchins.
Mr. and Mrs. Butler Sheldon.
Mr. and Mrs. E. R. Sharp.
Mr. and Mrs. O. A. Miller.
Mr. and Mrs. C. D. Firestone
Mr and Mrs. Henry J. Booth.
Mr. and Mrs. George W. Lattimer.
Mr. and Mrs. L. C. Bradley.
Mr. and Mrs. L. G. White.
Mr. and Mrs. William F. Burdell.
Mr. and Mrs. L. F. Kiesewetter.
Mr. and Mrs. Michael S. Hopkins.
Mr. and Mrs. H. M. Daugherty
Mr. and Mrs. S. P. Bush.
Mr. and Mrs. F. W. Schumacher.
Mr. and Mrs. John Y. Bassell.

Special Convention Committee.

E. K. Stewart, chairman, general manager Columbus Railway & Light Company, Columbus, O.

F. A. Davis, president, Scioto Valley Traction Company, Columbus.

J. L. Adams, general manager, Columbus, London & Springfield Railway Company, Columbus.

H. P. Clegg, president Dayton & Troy Electric Railway Company, Dayton, Ohio.

E. C. Springs, president Central Electric Railway Association, West Milton, Ohio.

J. B. Foraker, Jr., vice president Cincinnati Traction Company, Cincinnati, Ohio.

J. J. Stanley, general manager Cleveland Electric Railway Company, Cleveland, Ohio.

J. D. Callery, president Pittsburg Railways Company, Pittsburg, Pa.

C. L. Henry, president Indianapolis & Cincinnati Traction Company, Indianapolis, Ind.

F. W. Brooks, assistant general manager Detroit United Railway, Detroit, Mich.

Entertainment Committee of Manufacturers' Association.

C. C. Peirce, chairman, General Electric Company.
Harry Monroe, General Electric Company.
G. D. Rosenthal, General Electric Company.
W. W. Power, Allis-Chalmers Company.
Joseph Cunningham, National Brake & Electric Company.
F. B. DeGras, Crocker-Wheeler Company.
Julien Roe, Crocker-Wheeler Company.
W. H. Heulings, Jr., J. G. Brill Company.
Samuel M. Curwen, J. G. Brill Company.
F. A. Estep, R. D. Nuttall Company.
Daniel Royse, Electric Railway Review.
C. S. Clark, Pennsylvania Steel Company.
William Cuntz, Pennsylvania Steel Company.
J. W. Perry, H. W. Johns-Manville Company.
Samuel A. Megath, Galena Signal Oil Company.
Leroy C. Miller, Manager Street Railway Department, Galena-Signal Oil Company.
E. L. Janes, American Brake Shoe & Foundry Company.
W. K. Beard, Street Railway Journal.
J. C. Barr, Rail Joint Company.
W. R. Kirschner, Columbia Machine Works.
C. S. Powell, Westinghouse Electric & Manufacturing Company.
J. C. McQuiston, Westinghouse Electric & Manufacturing Company.
A. H. Englund, Electric Service Supplies Company.
P. A. Stranahan, Allis-Chalmers Company.
J. H. Denton, Allis-Chalmers Company.
M. W. Thomas, Allis-Chalmers Company.
F. A. Ward, Gold Car Heating & Lighting Company.
John H. Thomas, Standard Paint Company.
Fred C. Atwater, Columbia Nut & Bolt Company.
F. V. Green, Westinghouse Traction Brake Company.
Arthur W. Field, Standard Motor Truck Company.
F. H. Gale, General Electric Company.

Finance Committee of Manufacturers' Association.

Joseph R. Ellicott, eastern manager, Westinghouse Traction Brake Company, New York, chairman.

E. A. Craig, Westinghouse Traction Brake Company, Wilmerding, Penn.

S. I. Wailes, National Brake & Electric Company, Chicago.

A. H. Sisson, St. Louis Car Company, St. Louis.

Jos. A. Hanna, Niles Car & Manufacturing Company, Niles, O.

Bertram Berry, Heywood Bros. & Wakefield, New York.

John Bradley, Bradley Car Works, Worcester, Mass.

Cornell S. Hawley, Consolidated Car Heating Company, New York.

John M. High, Pantasote Company, New York City.

Local Committee of Engineering Association.

E. O. Ackerman, chairman, Columbus Railway & Light Company.

L. C. Bradley, Scioto Valley Traction Company.

W. P. Jackson, Columbus London & Springfield Railway Company.

W. H. Evans, Indianapolis Traction & Terminal Company, Indianapolis.

Burr S. Watters, Columbus Railway & Light Company.

E. H. Hitchcock, Professor of Experimental Engineering at the Ohio State University.

The officers of the Engineering association gave evidence of being true to the trust placed in them by being early on hand for the opening session. Among those who were known to have arrived by Sunday were President Adams, Vice-Presidents Fred G. Simmons, J. S. Doyle, Paul Winsor and Secretary and Treasurer S. Walter Mower. Fred N. Bushnell, a member of the executive committee and chief engineer of the Rhode Island Company, was also on hand.

THE ENTERTAINMENTS OF CONVENTION WEEK.

At the special request of President Ely of the American Street and Interurban Railway Association, the officers of the Manufacturers' association, having in charge the arrangements for entertainments, have studiously avoided making a programme that will be so elaborate as to be open to criticism—an end much to be desired on occasions such as the present. The programme, however, though simple and free from extravagance or display, promises much for the diversion and entertainment of the convention guests. Tonight (Monday) will be assembly night. The committee, having chosen the Southern Hotel as its headquarters has engaged the Ziegler-Howe Orchestra to furnish music in the parlors between the hours of 9 and 11 o'clock. An informal reunion and reception will take place during that time, which will afford an opportunity to all for making new acquaintances and renewing old friendships.

On tomorrow, Tuesday, evening, the local reception committee, with Mr. R. Grovenor Hutchins at its head will have charge. This committee has planned a grand reception, with dancing, which will be given at the Memorial building The event will be an important feature of the social affairs of the week. Memorial hall is located on Broad street, between Fourth and Fifth streets, about a block and a half east of the Capitol building. As this reception will afford the chief opportunity that the people of Columbus will have to show their visitors special attention in a social way, it is natural to expect that the attendance at the reception will be large. Chairman Peirce and his associates on the entertainment committe make a special request that the members of the several associations make a note of the time and place, and put forth a special endeavor to attend this affair.

The entertainment committee has obtained for Wednesday evening the two best theaters in Columbus, the Shubert, with "Fantana" on the boards, and the Great Southern, where the William H. Crane-Ellis Jeffreys combination is presenting "She Stoops to Conquer." The criticism was made last year, that on "that night" there were not enough theater tickets to go around. The committee recognizing that this criticism was to a certain extent well grounded, has enlarged upon the theater party feature, and has engaged the entire capacities of the two play houses. It is not at all likely that anyone who wants to attend the theater on Wednesday evening and who will take the trouble to apoly in season for a ticket, need be disappointed. The allotment of the theater tickets will, as in past years, be made according to badge numbers. Each member will be entitled to a ticket for himself and lady, provided she is a guest of the conventions. The tickets will be distributed at the booth of the Manufacturers' association at the fair grounds, but there will be no reserved seats. The doors of both houses will be thrown open at the usual hour, and the selection of seats will be on the basis of "first come, first served."

On Thursday afternoon, Mr. and Mrs. Amos Sharp will render a song recital at the Arlington Country club. Chairman Peirce's committee is subject to congratulation on being so fortunate as to procure the assistance of Mr. and Mrs. Sharp. Tea will be served at the club by the lady members of the local reception committee, and the function will necessarily be a pleasant and delightful one. The Arlington Country club can be reached by cars which start at Town and High streets, and run on High street to Goodale, passing the Neil, Chittenden and Northern hotels. The trip consumes about twenty minutes.

The annual banquet of the American Street & Interurban Railway Association will occur at the Southern hotel on the evening of Thursday. The tickets for the banquet will be $5 instead of $10, as in previous years, and they may be procured from Secretary Swenson at the registration booth near the entrance to the exhibit halls or at the Southern hotel. There will be accommodations in the banquet hall for about 600 people, and it is the expectation of those having the affair in charge that the reduced price of tickets, and the list of prominent speakers on the programme, which will be announced at a later date, will insure a large and enthusiastic gathering around the festive board on Thursday evening.

Chairman Peirce has reserved his most catching number for Friday evening, when the amateur vaudeville performance will be given at the Great Southern theatre. This is an event toward which conventionites look forward with a great deal of interest. It is hinted that not only will Chairman Peirce appear, but that he will be supported, physically or otherwise, by Mr. Heinrich Pirrung. Among the features of the programme for this occasion will be a little comedy, "The Game of Cards," by Mr. Evert Jansen Wendell, assisted by some prominent amateurs from New York. Mr. Wendell takes the place of his brother, Mr. Jacob Wendell, Jr., of the Wendell & McDuffie Company, who, on account of illness, will not be able to attend the conventions. Other numbers will be furnished by Mr. John H. Campbell, Mr. Thomas Bibber and Mr. Clarence E. Billings. The Republican Glee club of Columbus, an organization of 28 voices, will also render a number of selections.

THE CONVENTION BADGE.

In designing the convention badges for use at Columbus the excellent precedent of making them symbolical of the occasion and place has been followed. The design includes a car to show what our business is, and a track to show on what we run it. Within the loop enclosed by the track, which bears the name of the association, is the great seal of Ohio with the name of its capital city and the date, to show where and when we are. Draped above this are the United States, Canadian and Mexican flags, indicating all North America, whence we come. To show where we are, recourse is had to colored ribbons. Delegates to the American association convention will be distinguished by a blue ribbon; associate members of the American Association will have an orange ribbon; the Engineering association a brown ribbon, the Claim Agents a ribbon of olive green; members of the Manufacturers' association a ribbon of red, and guests of the convention a ribbon of white. Each badge bears a number, whereby, with the aid of the registration list which is to be published daily under the direction of the printing committee, one brother may track down another. As elsewhere announced, these badges will also serve the very useful, honorable and convenient purpose of makit wholly unnecessary to dig down into the jeans or the pocketbook for the wherewithal to dispel the stony stare of the omnipresent conductor; to worry about the possible length of time at the box office; to remember where such or such other card of invitation has been mislaid. Is is in fact, the "open seasame," but it is also the sine qua non and must be worn in a conspicuous place.

We understand that inasmuch as the Columbus Railway & Light Company sells car tickets at the unusually low rate of seven for 25 cents, it has arranged to give cash rebates of 1½ cents per ride to convention attendants from other cities when riding free on badges.

THE CONVENTION CITY.

The city of Columbus first assumed metropolitan airs in 1834, when its population was about 3,000. It was then incorporated as a city, though there are chronicles of an Indian village situated nearby many years before the coming of white men in 1816. All the romance of life in the west may be connected with its foundation, yet history chronicles no serious set-backs in a steady growth which has given it a present population of about 160,000.

Columbus the Convention City—State Capitol.

The city is situated on the east bank and not far from the source of the Scioto River, which in due course by way of the Ohio and the great Mississippi flows into the Gulf of Mexico. Its altitude above sea level is 750 feet and it has an area of a little more than 16 square miles. It is now distinguished as a city of substantial commercial and manufacturing interests, but its early growth and wealth have been chiefly due to the concentration of the state institutions, and many of these are the principal points of interest for the visitor.

The business thoroughfare, High street, runs approximately north and south and is 100 feet wide, and with Broad street, which is 120 feet wide for a distance of more than two miles, divides the city into the form of a Maltese cross. At the intersection of the two streets the Ohio State Capitol building is located. This occupies the center of a city block of ten acres known as Capitol Square. The building is of fine gray limestone resembling marble, and in the Doric style of architecture. It is 304 feet long and 184 feet wide, and the dome surrounding it is 64 feet in diameter and 157 feet high. Other buildings in or near the city are those of the state university, which is located on a tract of 320 acres not far from the Ohio State Fair Grounds, the state penitentiary and the Central Ohio Hospital for the Insane. Among the public buildings are the Institution for the Deaf and Dumb, the Institution for the Blind and the Institution for Feeble Minded Youths.

Columbus the Convention City—Birdseye View from the State Capitol Building.

The State Fair Grounds, where the exhibits will be shown and the business transactions of the convention held, comprise some 115 acres located due north of the state capitol, and within 15 minutes by street cars from the center of the city. The grounds are spacious and well equipped and are undoubtedly among the largest and finest in the country. With their buildings they represent an investment on the part of the state of about $2,000,000, and heretofore have been used exclusively for the state agricultural fairs, which are held during the first part of September. Through the efforts of the Columbus Board of Trade, permission was secured from the State Board of Agriculture to extend the use of the grounds without charge to the American Street & Interurban Railway Associations.

The buildings which will be used for exhibit and convention purposes are the Manufacturers' building, East Central building, Agriculture building, Horticulture building and Convention Hall, which is also known as the West Central building. The buildings which are available for convention purposes have a floor area of about 110,000 square feet.

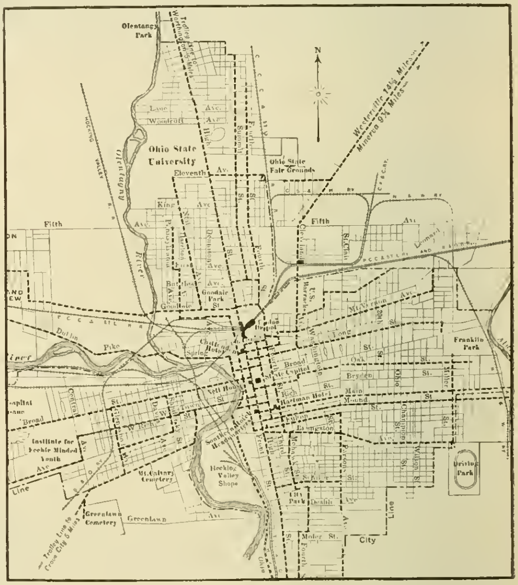
Columbus is quite properly the convention city for the street and interurban asociations, as it is one of the principal centers of electric interurban traction activity. It has lines radiating from the city to as many points of the compass, operating cars to all the important surrounding towns and villages, connecting with Cincinnati and Indianapolis, and with only short links remaining to be built to connect with Cleveland and Toledo, and other large centers of population.

The interurban roads centering in Ohio's capital city represent an investment of about $49,000,000, of which $18,000,000 is common stock, $18,741,000 preferred stock and $12,318,000 funded debt. It is only possible to estimate the hundreds of thousands of people which are annually carried by the interurban lines. Eighteen steam roads enter the city and there are 148 passenger trains daily. The union station is one of the most attractive of the public buildings from an architectural standpoint.

Columbus the Convention City—Court House.

Columbus the Convention City—Union Station

The ten lines entering the city are those of the Columbus Railway & Light Company, the Central Market Street Railway, the Columbus, London & Springfield Railway, the Columbus, Delaware & Marion Railway, the Columbus, New Albany & Johnstown Railway, the Columbus, Buckeye Lake & Newark Traction Company, the Scioto Valley Traction Company, the Columbus, Newark & Zanesville Electric Railway, the Columbus, Grove City & Southwestern Railway and the Columbus, Urbana & Western Electric Railway. All of these lines, with the exception of the Columbus, Newark & Zanesville, have their principal offices in the city of Columbus, and may properly be said to be distinctively Columbus organizations. The Columbus Railway & Light Company operates practically all of the city lines. It has 107.4 miles of track and 312 cars and owns Minerva Park and also the popular Olentangy Park. The Columbus, Newark & Zanesville extends from Columbus through Newark to Zanesville, including approximately 30 miles of city lines in Newark and Zanesville. The Columbus, London & Springfield from Columbus to Springfield and the Columbus, Grove City & Southwestern from Columbus to Morgans are included in the properties of the Indiana, Columbus & Eastern Traction Company and represent 170.6 miles of track. The Columbus, Urbana & Western Electric Railway was organized to construct an electric railway from Columbus through Mechanicsburg to Urbana. Franchises have been secured and about 10 miles of the line has been built. No capital stock has been issued as yet and the investment in this property is not included in the totals earlier mentioned. The total miles of track of the ten roads is 430.4. A number of beautiful parks are within easy reach of the center of the city by means of the lines of the Columbus Railway & Light Company. Olentangy Park, before mentioned, can be reached over its lines, and those of the Columbus, Delaware & Marion Railway. The park is a short distance north of the fair grounds. Among the other city parks are those known as Franklin, City and Goodale. The latter park is within walking distance of the union station and Franklin Park, which is on the east side of the city, may be reached by the cars of the Columbus Railway & Light Company. Glenmary Park, Stratford Park and Marion Park are owned by the Columbus, Delaware & Marion Railway and may be reached over its lines.



Map of the City of Columbus.

Columbus has a reputation as a home city. The finest residences are to be found in the northern and western portions, but substantial homes are found in every part of the city. One feature that tends to give a visitor a good impression of the residences is the broad and well kept streets. The healthfulness of the city has done much to attract home seekers. For many years Columbus has enjoyed the reputation, based upon the official mortality statistical reports, of being the healthiest city of its size in the United States.

Educational facilities are unexcelled. Institutions of learning from kindergarten to university are numerous. There are 40 imposing and commodious school buildings and others are contemplated or already in process of erection. There are four high school buildings, several normal and eight Catholic parochial schools. The state university, at which more than 2,000 students are annually in attendance, is one of the leading institutions of its kind in the country. It is a university in the true sense of the word, courses being provided in various branches of engineering, as well as classical, literary and scientific lines. Three other universities can be reached by the ever serviceable interurban roads. They are Otterbein University of Westerville, O.; Wesleyan University of Delaware, O., and Wittenberg University of Springfield, O. There are 122 churches in Columbus and the value of church property is nearly $3,000,000. Among the prominent clubs are the Columbus Club whose building is located at the intersection of Broad and Fourth streets, and the Arlington and Columbus Country clubs.

From a commercial standpoint Columbus is distinguished by her industrial concerns which are said to be the largest of their kind in the world. The leather manufacturers of Columbus use one-seventh of the leather consumed in the United States and the city is said to produce a greater number of high grade vehicles than any other city in the world. The annual consumption of coal amounts to 2,500,000 tons and over $20,000,000 are invested in the steel and iron industries. The total valuation of taxable property in 1904 was nearly $100,000,000 and the per capita wealth was $625.0.

Though not a city which may be said to favor municipal ownership, Columbus has built its electric lighting plant at a cost of over $500,000, and controls its waterworks system. A concrete dam across the Scioto river will represent, when fully completed, an expenditure of over $1,000,000 and will furnish a reservoir having an area of 700 acres, with a storage capacity for water which it is estimated will be equal to the demands of a city with a population of 1,000,000 persons. In connection with this project there will be an immense filtration and softening plant which is to cost $1,200,000. Aside from these projects the city is also to undertake a sewage disposal plant for which an appropriation of $1,100,000 has been made.

Columbus the Convention City—Boat Landing, Olentangy Park.

Columbus has been distinguished as a convention city before it was favored with the meetings of the American Street & Interurban Railway Associations. It is said that recently there has been more than one convention for every day in the year, and with such an experience the inhabitants of Columbus ought to be well prepared to undertake and care for her present visitors.

Columbus the Convention City—High Street at Night.

ACCIDENT IN CHICAGO.

Those among the street railway men here whose experience includes the operation of cable, can scarcely fail to be startled at the following account which appeared in the Chicago Tribune some time since, before Captain McCulloch left Chicago:

CABLE BREAKS.

Most Remarkable Accident in History of Curious Happenings—Superintendent of Traction Company Unable to Explain Break—Interviews with Passengers.

The unexpected—more, the incredible—happened yesterday afternoon.

The Cottage Grove avenue cable suddenly broke, and pedestrians were treated to the amazing spectacle of cable trains standing motionless on the tracks,

"As idle as a painted ship
Upon a painted ocean."

As for the passengers, they were simply stunned with surprise, and it was some time before the newspaper men could get from them a record of their wonderful experience.

Mr. D. F. Strapholder of 1191 Flatville avenue said: "We were rushing along at the usual rapid clip when suddenly, without warning, the train slowed down to a standstill and remained motionless. We rushed from the cars and learned that the cable had broken. Every one was astounded and refused to believe it."

Mr. T. Rolley Grabhand of 45 Bluenose place said: "When some one cried that the cable had broken I laughed incredulously. It was impossible. It had run so perfectly for so many years that it seemed as near perpetual motion as the earth or moon. I can still hardly believe it."

A tall man in a light brown overcoat, who refused to give his name, said: "It is the strangest experience of my life."

WHAT MANAGER McCULLOCH SAYS:

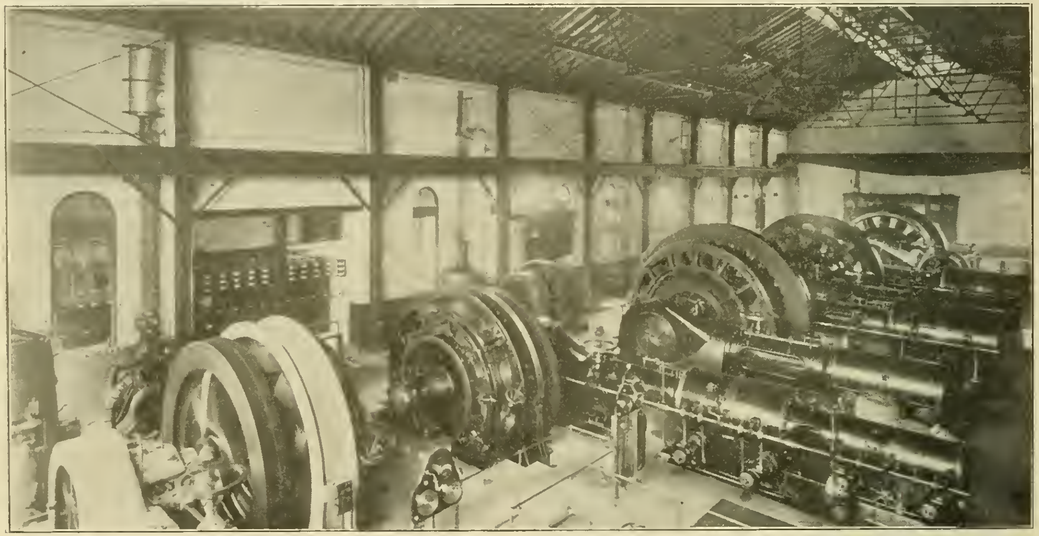
"I was as much dumbfounded," said Manager McCulloch, handing the reporter a fat cigar, "as if the sky had fallen. When we bought that cable we had the guarantee of the manufacturer that it would run ninety-nine years, and as the years went by and not the slightest evidence of wear could be found upon it we came to believe it was indestructible."

"Is the cause of the break yet known?" asked the reporter.

"No," replied Manager McCulloch, thrusting another long black cigar into the reporter's vest pocket; "but we expect to ascertain before night. What we are chiefly worried about is the comfort of the passengers. We fear some of them may have been delayed by the breakdown. However, we know the public has confidence in us, and we are doing all we can to deserve it."

SOME NOTES ON THE COLUMBUS RAILWAY & LIGHT COMPANY.

The street railway and the principal commercial electric lighting and power business of Columbus is conducted by the Columbus Railway & Light Company, an Ohio corporation, chartered on May 12, 1903. Its capital stock authorized is $5,000,000, on which 20 per cent has been paid in. This company has leased the properties of the Columbus Railway Company and the Columbus Edison Company, the rental being guaranteed dividends of 5 per cent per annum on both preferred and common stock of the Columbus Railway Company and 6 per cent per annum on the preferred stock and 5 per cent per annum on the common stock of the Columbus Edison Company. The payment of dividends on the common stock by the lessee company began September 1, 1903. When the Columbus Railway & Light Company was organized the holders of the common stock of the Columbus Railway Company and Columbus Edison Company were given the privilege to subscribe for stock in the new company equal to their holdings in the old companies, 20 per cent to be paid in cash and the balance subject to call at the rate of not more than 10 per cent in any one year. The Columbus Railway Company was incorporated in August, 1899, and October 2, 1899, effected a consolidation of the Columbus Street Railway Company (chartered April 25, 1892), the Crosstown Street Railway Company (chartered 1893) and the Columbus Central Railway Company (chartered 1893).



Columbus Railway & Light Company—Interior of Spring Street Power Station.

The company controls 107.4 miles of track, 5 miles being a new suburban line, and 12 miles an interurban line; of this 43.5 miles are double and 20.4 miles single track. On July 1, 1906, the company began operating the property of the Central Market Street Railway Company for the owners. The gauge of the city system is 5 feet 2½ inches; the gauge of the Central Market Company's track, which furnishes entrance for interurban lines, is 4 feet 8½ inches.

For the year ending on December 31, 1905, earnings and expenses of the company were as follows:

Receipts	$1,470,209.50	$328,253.09	$1,798,462.59
Operating expenses ...	707,757.75	175,466.30	883,224.14
Net earnings	$ 762,451.75	$152,786.70	$ 915,238.45

For the year 1905 the number of revenue passengers carried was 39,357,715; the number of car-miles run was 6,006,923; the miles of street over which cars were operated was 60.025 and the total measured at single track was 102,378, The average number of cars per day of 18 hours was 103, the number of cars available for service being 251. For the seven months, January to July, 1906, the number of car-miles run was 3,571,838, an increase of about 2.38 per cent, as compared with the corresponding months for 1905.

The company owns Olentangy Park, located three miles north of Capitol Square. This was built in 1896 and in 1899 was leased to the Olentangy Park Company, by which it is now operated.

The organization of the company is simple, the general superintendent who is in charge of construction and operation, and the auditor who has charge of accounting and office matters, both reporting to the vice-president and general manager. The officers are: President, R. E. Sheldon; first vice-president, general manager and treasurer, E. K. Stewart; secretary and auditor, P. V. Burington. The general superintendent is L. G. White and the assistant general superintendent and purchasing agent, C. C. Collins.

Reporting to the general superintendent are nine heads of departments:

Superintendent of Transportation, G. R. Whisner.
Electrical Engineer, R. J. Feather.
Engineer of Maintenance of Way, E. O. Ackerman.
Chief Engineer of Power Stations, F. R. Brosius.
Master Mechanic, Charles Hott.
Superintendent of Railway Overhead Lines, Frank Stultz.
Superintendent of Lighting Lines, D. L. Chase.
Storekeeper, W. G. Steirhoff.
Contract Agent for Lighting, M. C. Hull.

The general offices are located in a four-story building on the east side of High street (Nos. 12 to 16), within a half block of the capitol grounds.

The company operates three power stations of its own and since July 1 that of the Central Market Street Railway Company.

Station No. 1, at Spring street and Cozzins avenue, ¾ mile northwest of the center of the city, has the following equipment:

Two 1,000-kilowatt, one 850-kilowatt and two 500-kilowatt General Electric generators for the railway load. These machines generate at 575 to 600 volts and are direct connected to Green-Wheelock cross-compound engines.

Columbus Railway & Light Company—Gay Street Power Station.

Two 500-kilowatt Curtis turbo-alternators for the lighting load; a 1,500-kilowatt Curtis turbo-alternator is now being installed. The machines generate 60-cycle, three-phase current at 4,100 volts.

Columbus Railway & Light Company—High Street Office Building.

One 500-kilowatt and one 300-kilowatt motor-generator units for adjusting the output between railways and lighting loads and for effecting transformations in case of accidents to the generating machinery.

One booster which is not now in use.

The boilers at this station are ten 350-horsepower Babcock & Wilcox, furnishing steam at 175 pounds; two are gas fired, two are hand-fired with coal and ten have Green chain grates. Six boilers are operated under natural draft and eight by induced draft, using Sturtevant fans. The equipment of the station includes Wheeler condensers, Edwards air pumps and Green fuel economizers.

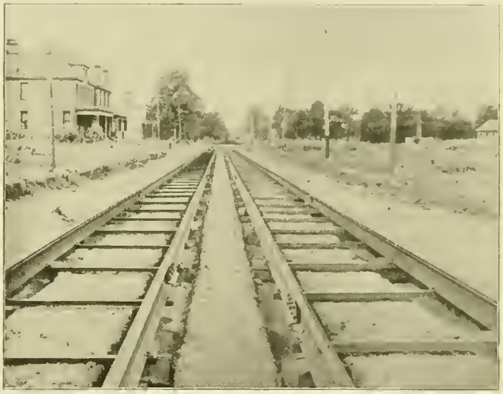
Station No. 2 is at Gay and Third streets, two squares northeast of the company's office building. Here are:

One 1,000-kilowatt, 250-volt, two 480-kilowatt, 250-volt and two 200-kilowatt, 125-volt generators direct connected to vertical cross-compound McIntosh & Seymour engines.

Two 100-kilowatt, 125-volt and four 60-kilowatt, 125-volt Edison generators, belt driven from three Armington & Sims engines, which are used for boosting individual feeder lines.

Two 400-kilowatt, three- unit motor-generators sets delivering direct current at 125 volts.

Two batteries of the Electric Storage Battery Company's chloride accumulator. One of these is 925 ampere-hours capacity, consisting of 150 G31 cells and normally floats on the lighting load. The other has a capacity of 1,500 ampere-hours (320 G41 cells) and normally floats on the railway load; it may be divided in two sections, however, and used on the lighting system.


Columbus Railway & Light Company—Standard Track.

At this plant there are eight Babcock & Wilcox boilers set in batteries of two and working at 130 pounds pressure. The stack is of steel 12 feet in diameter by 150 feet high. Part of the station is operated condensing, there being a home-made cooling tower of 1,300 horse-power capacity.

Station No. 3 is at Milo, outside of the city limits, and about 2½ miles northeast of the center of the city. At this plant, which is for railway work only, there are one 400-kilowatt and two 200-kilowatt Westinghouse "Kodac" 600-volt generating sets and one 500-kilowatt two-unit motor generator built by the National Brake & Electric Company of Milwaukee. The boiler equipment consists of six 260-horse-power Sterling boilers working at 125 pounds pressure.

The power station of the Central Market Street Railway Company is at Central avenue and Mound street, two miles southwest of the center of the city. The equipment here includes two 325-kilowatt, 600-volt generators direct connected to Hamilton-Corliss cross-compound engines operating non-condensing; one 200-kilowatt, 600-volt General Electric generator belted to a Hamilton-Corliss simple engine and a 500-ampere-hour chloride accumulator (290 G15 cells) which floats on the railway line. The boilers are one 500-horse-power Babcock & Wilcox and five 125-horse power return tubular.

Ten miles out on the Westerville division (the company's interurban line) is a chloride accumulator of 230 F7 cells, 120 ampere-hours capacity.

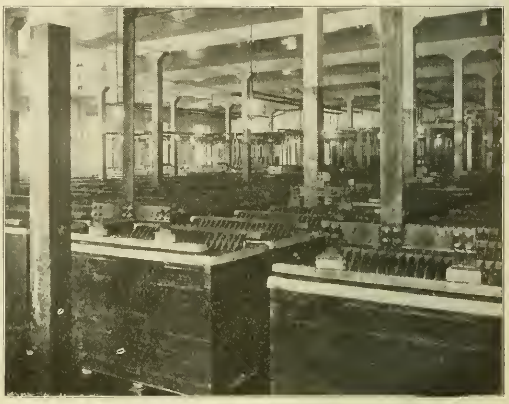
The lighting department has contracts for motors and lights aggregating about 10,000 kilowatts, 3,000 in motors and 7,000 in lights.

The power equipment of the company provides for the generation of railway current at 600 volts and the lengths of the lines being such as to make direct current distribution practicable, there are no substations for the railway system, other than the battery station on the Westerville line. As the company has contracts to supply current for power to several customers using large quantities, substations are necessary at these plants. At the plant of the Jeffrey Manufacturing Company there has been installed a 500-kilowatt, two-unit motor-generator set, the motor receiving 60-cycle alternating current at 4,100 volts and the generator delivering direct current at 250 volts. There is soon to be installed for the F. & R. Lazarus Company one 250-kilowatt, two-unit motor-generator set, built by the National Brake & Electric Company of Milwaukee, and at the plant of the Hoster Brewing Company a 300-kilowatt General Electric two-unit motor-generator set. Both of these motor generators are for making the same transformations as at the Jeffrey plant.

Columbus Railway & Light Company—General View of Display Room, Lighting Department.

Columbus Railway & Light Company—View of Track-Ballasting Cars.

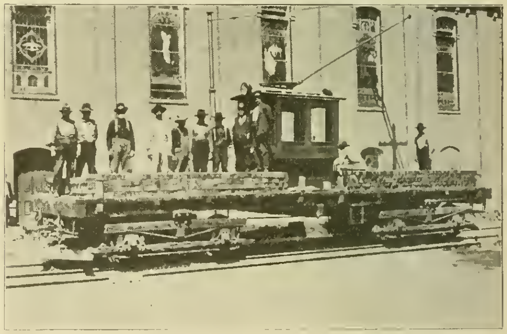
In keeping records of various kinds the company uses graphical methods to a great extent. Some of the power house records will serve to illustrate the scheme which may be widely applied. The daily power house logs show the output plotted as the curve with a simple color scheme to indicate what portion was carried by generators, what by storage batteries, etc. Rulings are provided on this blank for boilers ,engines, firemen, engine-room men, etc., for recording the time each is in service or on watch; vertical lines are spaced at equal distances and numbered to correspond to the 24 hours of the day, these being crossed by horizontal lines. The time for an engine or boiler is entered by marking along the horizontal line opposite the proper number a heavy line extending between the hour lines. For the personnel the names are written in and the time on duty similarly marked.



Columbus Railway & Light Company—Gay Street Storage Battery.

Track Construction.

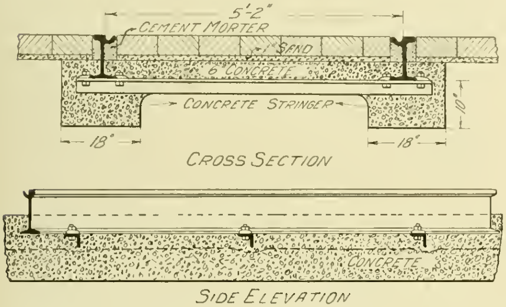
The company, since 1898, has been laying nearly all track on concrete girders. Angle bar ties 2½x2½x¼ inches 6 feet 2 inches long are spaced 5 feet between centers. This year some track has been laid with 79-pound, 8-inch T-rails (Lorain section No. 373) with concrete foundation. The two types of construction are shown in the drawings. In this work the concrete used is 1 part Portland cement, 3 parts sand and 5 parts broken stone. The concrete is allowed to set for seven days before traffic over the new track is resumed.



Columbus Railway & Light Company—Work Car.

At crossings with steam railroads an especially heavy construction is used. A bed of concrete 12 inches deep is laid and allowed to set while the tracks are blocked up; on top of this are placed 10x16-inch timbers to carry the rails of the steam track, into which are framed 6x12-inch timbers for the electric track, with heavy braces and tie-rods. The concrete foundation is placed deep enough so that the timber framework needs to be raised an inch or so to bring the track rails to grade. The space under the frame is pick-tamped with a dry-concrete mixed with pea gravel, after which properly mixed wet concrete is filled in about the timbers. The object of tamping the frame with dry concrete is to permit the crossing to be used without waiting for the wet concrete to set; the dry mixture absorbs the necessary moisture from the surface layer of wet concrete which is adjacent to it.

In the track construction continuous rail joints are used. The rail bonds are of the all-wire type, some made by the Ohio Brass Company and some by the railway company. The bonds are of a section equivalent to No. 00 wire and have ¾-inch terminals; two bonds are used at each joint.



Columbus Railway Light Company—Details of Standard Track Construction with Steel Tie-Bars.

In 1902 about 5,900 joints were electrically welded by the Lorain Steel Company. At this time the tracks in portions of Front, Fulton, High, Livingston, Fourth and Spring streets were welded to form a loop in the central part of the city. Insulated copper cables, either two of 500,000-circular mil section or two of 300,000-circular mil section, were laid around special work in this portion of the track. The return feeders to the power houses are tapped into this track loop at several points, the arrangement greatly improving the return circuit.

Rolling Stock.

The company has 367 passenger cars, of which 200 are closed motor cars, 126 open motor, 16 closed trailer and 16 are open trailer cars. These are for the most part double truck cars and are mounted on maximum traction trucks. Most of the closed cars were built by the Brill company and most of the open cars by the Barney & Smith and the St. Louis Car companies. Closed cars are nearly all 20 and 28 feet long and open cars 10 or 12-seat.

The motors used include the S. R. G., G. E. 52, G. E. 800, G. E. 67, Westinghouse 12 and Westinghouse 49. K10 and K12 controllers are used on the greater part of the equipment. Sixty cars are equipped with air brakes of the Christensen make, with 10-inch cylinders and designed for 70 pounds pressure; 40 cars have National Electric No. AA1 compressors and 20 have General Electric C. P. 21 Form B. compressors.

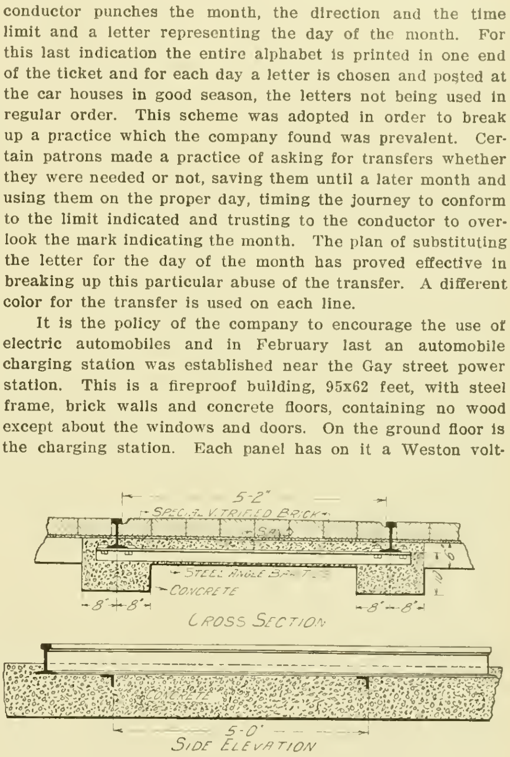
Included in the miscellaneous equipment are 55 sand cars, 5 snow-sweepers, 5 work cars, 1 wreck car, 1 bond-testing car, 6 center dump cars, 6 side dump cars, 5 flat cars, 1 baggage car, 3 snow-scrapers and 1 line car.

The shops of the company are located at Rose and Oak streets, about two miles east of the central part of the city, and here are done the general repairs and all painting and also assembling of the new equipment, about 75 men being employed. Besides this force the master mechanic has under his direction 24 men who are stationed at the six operating car houses for the inspection of equipment and making slight repairs. Five of the operating car houses referred to are those of the Columbus Railway & Light Company and the sixth that of the Central Market Street Railway Company. The work done at the shop includes repairs to cars and trucks, making bearings, both brass and babbitt, making armature and field coils and trolley wheels.

Fares and Transfers.

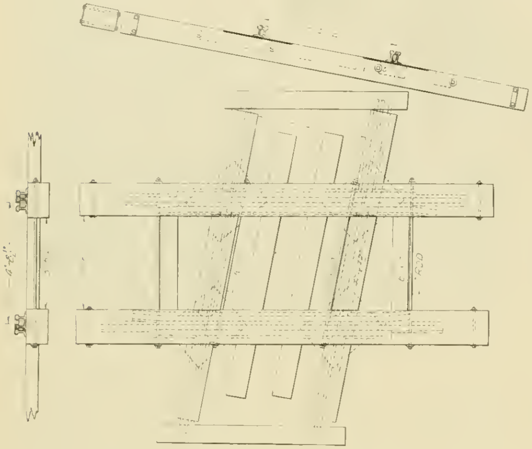
For operating purposes the system is divided into 13 lines or routes for the company's own lines and 3 for Central Market lines. Each line is designated by the name of the terminus or the names of one or two streets over which it runs. The single fare on the system is 5 cents. Tickets are sold at the rate of 7 for 25 cents, with the privilege of transfer. The only restrictions made as to transfer are that the passenger shall name the direction in which he wishes to continue his journey and shall use the transfer within the time limit punched, which is made 15 minutes after a reasonable arriving time at the transfer point. In issuing the transfer the conductor punches the month, the direction and the time limit and a letter representing the day of the month. For this last indication the entire alphabet is printed in one end of the ticket and for each day a letter is chosen and posted at the car houses in good season, the letters not being used in regular order. This scheme was adopted in order to break up a practice which the company found was prevalent. Certain patrons made a practice of asking for transfers whether they were needed or not, saving them until a later month and using them on the proper day, timing the journey to conform to the limit indicated and trusting to the conductor to overlook the mark indicating the month. The plan of substituting the letter for the day of the month has proved effective in breaking up this particular abuse of the transfer. A different color for the transfer is used on each line.

It is the policy of the company to encourage the use of electric automobiles and in February last an automobile charging station was established near the Gay street power station. This is a fireproof building, 95x62 feet, with steel frame, brick walls and concrete floors, containing no wood except about the windows and doors. On the ground floor is the charging station. Each panel has on it a Weston voltmeter and ammeter, Thomson recording wattmeter, Bristol recording instruments and circuit breakers. Besides operating the charging station the company carries here a store of sparking batteries and other electrical supplies for automobiles.



Columbus Railway & Light Company—Details of Track Construction for Pennsylvania Avenue Improvements.

Some years ago the Columbus Railway Company adopted a plan of sharing profits with employes, the payment made to the employes being termed an "employes' dividend," which is paid quarterly at the same time dividends are paid to stockholders of the company. At this time the rate of dividend on both preferred and common stock of the Columbus Railway Company is 5 per cent per annum each, payable quarterly. Each employe receives 5 per cent of his earnings for the quarter for which the dividend is paid, which amounts to 5 per cent per annum on total wages earned for the year. To participate in a dividend an employe must have been in the continuous service of the company six months prior to the date on which a dividend is paid; that is, if a dividend is paid on August 1 for the quarter ending on July 31, such employe is not entitled to participation unless practically full service has been given since February 1. Should an employe leave or be dismissed from the service of the company during the quarter in which dividend is computed, he forfeits all claim and his account is ruled off of the books of the company. This applies to stock issues of the Columbus Railway Company, now being operated under lease by the Columbus Railway & Light Company. The latter company has a stock issue of its own, but no regular dividend-paying dates have as yet been established. However, a dividend of 1 per cent on this issue was paid on July 15, 1905, and the same amount July 16, 1906, in which employes participated in the same ratio, making altogether for the current year 12 per cent on their earnings for employes.


Columbus Railway & Light Company—Plan of Timbers Used under Steam Railroad Crossing.

How to Reach the Fair Grounds.

During convention week the Columbus Railway & Light Company will operate cars between the down-town district and the convention grounds under a five-minute headway over two lines. Anyone desiring to get to the grounds from any part of the city has only to inquire his way to High street, where he can catch a car direct to the exhibit halls without delay. All North Fourth street cars and Summit street cars will run around the loop at the Main entrance to the Fair Grounds, and will be provided with appropriate dash signs to prevent any possible chance of delegates becoming confused in journeying from the various hotels. All cars going direct to the fair grounds pass in front of the following hotels:—Great Southern, Neil, Chittenden, Star, and within one-half block of the Northern. They also pass immediately in front of the Union station entrance.

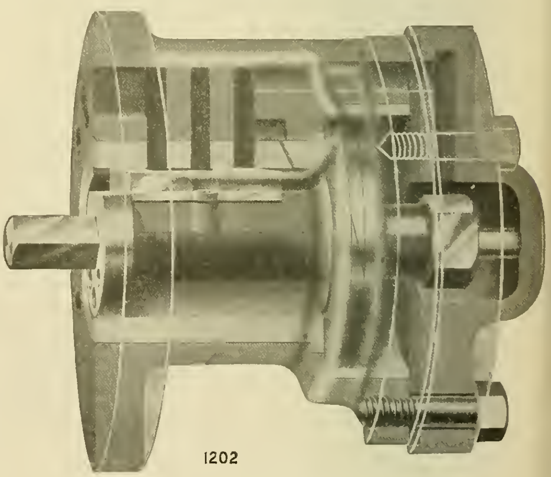
Prof. Dugald Caleb Jackson, of the University of Wisconsin, has been appointed as the head of the department of electrical engineering of the Massachusetts Institute of Technology, at Boston, Mass., succeeding Prof. Louis Duncan, who resigned two years ago. Prof. H. E. Clifford, of the institute, who has been filling the position temporarily, will now devote more of his time to consulting engineering

NATIONAL EMERGENCY VALVES.

The National Brake & Electric Company, Milwaukee, Wis., has designed an emergency valve for use on straight air-brake systems, which overcomes the objections to the straight-air brake system when it is applied to short trains, and still retain its simplicity and reliability. The application of this emergency valve to straight-air brake systems adds to the equipment the emergency device only, which is simpler in design and construction than any plain triple valve. The working parts of the valve are few in number, consisting merely of a piston, a slide, a release spring moving in an air chamber, a conductor's valve, operator's valve, an auxiliary reservoir and one pipe running the entire length of the train. The train pipe is required in the equipment only in cases where the motor car pulls trailers on which there is no controlling apparatus. Where two or more motor cars, or the motor and the trail car are provided with a controlling device, no additional hose connections are required, as in such cases it is only necessary to connect all reservoirs by means of an auxiliary hose in addition to the one provided for the straight air-brake train pipe.

The manner of applying the straight air-brake equipped with the new emergency valve remains unchanged, since there is an unobstructed opening provided between the straight-air train pipe and the brake cylinders when the emergency valve is in release position. A passage is provided between the main reservoir and the emergency line to maintain the pressure in the latter throughout the train equal to that in the main reservoir, while pressure is being raised in the main reservoir, by the compressor. An additional orifice between the main reservoir and the emergency line, connects the latter to the slide valve chamber, which being in direct communication with the auxiliary reservoir also maintains the auxiliary reservoir charged to the same pressure as the emergency line and main reservoir.

Should a conductor's valve open or the train become disconnected, air is allowed to escape to the atmosphere from the emergency line. The escape of air causes a rapid reduction of pressure on that side of the piston towards the emergency line and thus unbalances the pressures on both sides of the piston, the result being that the greater pressure on the auxiliary reservoir forces the piston and slide valve to the extreme length of their travel. The occurence of the above mentioned contingencies causes the emergency valve to effect several combinations, as follows: The straight-air train-pipe is



Cut-Away View of National Emergency Valve.

disconnected from the brake cylinder and connected to the emergency line, and the emergency valve, thus discharges the same function as a standard quick-action triple valve. The auxiliary reservoir is disconnected from the emergency line and is connected directly to the brake cylinder through a large orifice, which results in an instant equalization of the pressure in the brake cylinder and the auxiliary reservoir, which causes maximum brake pressure to be applied almost instantaneously. The opening from the main reservoir to the emergency line is closed by the piston when it has traveled the full length of its stroke, which permits no escape of reservoir air through the open emergency line.

The operation of the emergency valve to release the brakes is as follows: The conductor's valves and angle cocks are first closed. The straight-air operating valve is then thrown to emergency position, which action connects the main reservoir to the straight-air train pipe. As the straight-air train pipe is in direct communication with the emergency line, it is obvious that the emergency line will be rapidly charged to main reservoir pressure. The increased air pressure aided by the release spring on the emergency valve forces the piston and slide valve to full release position, thereby disconnecting the brake cylinder from the auxiliary reservoir and connecting it to the straight-air train-pipe; and at the same time connects the auxiliary reservoir to the emergency line. The release spring on the emergency valve is adjusted to approximately 15 pounds pressure, which permits release with a lower reservoir pressure than that which exists in the auxiliary pressure, and insuring an instant reversal of the emergency valve piston. The release of pressure in the brake cylinder is thus effected by throwing the straight air operating valve to release position in the usual manner. The release of air from the brake cylinder can be effected through a graduated series of steps as in the straight air-brake system, making a gradual and smooth stopping of the train with ease.

Unless the straight-air pipe is closed, a release of brakes cannot be effected on brake systems equipped with the National emergency valve until the train is brought to a stop, as sufficient pressure cannot be attained in the emergency line to reverse the piston, since air will blow directly to atmosphere in case of the straight-air train pipe being open at any point. When used on trains equipped with the multiple-unit system of control, in which two or more pumps are employed, all reservoirs on the train are connected to the emergency line through ports provided in the emergency valve. This eliminates the disadvantages of a third hose, and in the event of a failure of the pump on the motor car controlling the train, air will be admitted from the rear reservoir through emergency valves and emergency line to the main reservoir on the controlling car. This insures equal pressure on all reservoirs and provides a supply of air for applying the straight air brake from the controlling car.

In case of a sudden drop in the main reservoir pressure due to a fractured or broken main reservoir pipe, the emergency line pressure will be rapidly decreased, thereby causing the greater pressure of the auxiliary to move the piston to the extreme position, and giving an emergency application of brakes independent of the operator.

From the standpoint of maintenance of this equipment, the additional expense over the ordinary straight air-brake system will be very small, as there is practically no wear on the slide valve or piston, because they remain inoperative until needed. This will insure a longer life to these parts than to any other part of the air-brake equipment.

Both the Postal and Western Union telegraph companies have opened temporary offices at the booth of the Manufacturers' association at the Fair Grounds as well as at the Southern hotel, so that people in attendance upon the conventions will have ample telegraphic facilities.

ELECTRIC RAILWAY BRAKE SHOES.

BY F. W. SARGENT.

Brake shoes for electric railway equipment may be divided into two general classes: A—Combination heads and shoes; B—Separate heads and shoes. This latter class can again be divided into: (1)—Separate shoes with head connections which are not symmetrical with regard to end stops and central lug, requiring a right hand and left hand pattern of shoe, and which differ as to distances between end stops and as to size and location of the central lug. (2)—Separate shoes which are symmetrical with regard to the central lug, which can be reversed on brake head, and require a single pattern.

Shoes in class A are the relics of old practice handed down from the antiquated horsecar and, strange to say, still perpetuated on what is otherwise modern equipment. These shoes are expensive in their first heavy cost and high scrap weight, and are doubtless continued in use because of the truck construction which will not permit the brake beam to be slacked back far enough to slide a shoe in between the head and the wheel, and some people are satisfied to scrap the extra head metal with each shoe, because the advantage of a separation has not been brought to their notice. It is to be doubted if trucks will ever be constructed to permit the changing of the shoes without removing the head also, as is done in steam railroad practice, on account of the shorter wheel base required in cars running over the sharp curves of city work, but there is no good reason why both head and shoe cannot be removed and the shoe changed and both replaced together—when they cannot be attended to without doing this.

There are some electric railroad men who appreciate the advantages of separate brake shoe and head and recognize the expense attendant upon the use of the combined head and shoe; also some truck builders who appreciate this point, but there are still many roads using these one-piece shoes which could change over and save money.

The separate shoes and heads in use are not at all what is best for several reasons: They are all different, varying in size of lug, in distance between end stops, and in the keyway location and opening. Many shoes have the lug nearer one end of the shoe than the other, and they are all non-interchangeable and a separate pattern of shoe is required for each particular truck, and often a right hand and a left hand shoe.

The Master Car Builders' standard shoe of steam practice is a particularly neat design; it is in fact an ideal design, which accounts for its universal acceptance and approval. It has minimum weight, with the maximum of service metal and the minimum of scrap. The shoe is symmetrical, can be used on either side and has not more metal in the lug and end stops than is necessary for safety. And this is the ideal which will doubtless appeal to the standardization committee of the American Street and Interurban Railway Association, and it may be expected to adopt a standard pattern of shoe which can be applied to the standard brakehead and facilitate the interchange of shoes on all cars.

The cost of brake shoes is not merely the price paid for the material purchased, but includes also the additional charges due to the handling and caring for stock and depends upon the amount of good derived from the material applied to the car. A multitude of patterns; a large, diversified stock of shoes which are non-interchangeable means more money spent than would be required to keep on hand a stock of shoes of a single pattern or, at most, two or three patterns, which interchange throughout the equipment.

Figures 1 to 6 inclusive show some types of combined heads and shoes which may serve to show the wide variation in design. There are a great many such shoes. But these will serve to show the extravagance in extra metal purchased and scrapped. The average weight of such shoes rarely is less than 50 per cent of the original. These shoes are heavy and cumbersome, seldom hang right on the beam and almost invariably are scrapped early in life because worn down at one end.

Figures 7 to 12 inclusive, show types of separate shoes which are in use on the more modern electric equipment The chief objection to these patterns is their diversity and non-interchangeability. They are a step in the right direction and emphasize the importance of a standard which will be common to all roads.

Some electric railways, notably the heavy interurban and elevated lines, have gone to the M. C. B. standard and all the surface lines should adopt the same thing.

Figure 16 shows a pattern of shoes which is on the lines of the M. C. B. standard as to location of lug and distance between end stops. It shows the end stops and guides as well as the center lug with the least amount of metal to be scrapped, and this shoe has been worn down to 6½ pounds, giving 73 per cent of useful wear in actual service. If properly cared for this shoe should give a scrap weight of 6 pounds, and the new weight for the ordinary equipment (33-inch wheel) is 24 pounds. It is a shoe which can be turned end for end and placed on the opposite end of the beam in case the shoe begins to wear tapering. It is common practice on steam roads to keep reversing the shoes as they wear down to get even wear and by changing over the shoes on the electric car the same result as to getting the maximum wear can be secured. The wire back reinforcement in the shoe shown is an advantage especially important in enabling the shoe to be worn to the limit without falling to pieces. The lug reinforcement overcomes a frequent source of loss due to lugs breaking in handling and in fitting the key. It is a necessity in shoes of the extra durable type when hard iron body metal is called for. When soft iron shoes are used the lug can be made without reinforcement.

The separation of brake shoes into a head of malleable iron and a shoe which will be common to these heads has been going on for some time. One of the largest electric railway systems in the East has thrown out the old equipment which called for shoes weighing from 30 to 40 pounds each which were scrapped at 20 to 30 pounds, and has installed a right and left hand break head weighing 9 pounds, which takes a common shoe weighing 23¼ pounds. Figures 18 and 19 show them. The scrap weight of this shoe is less than seven pounds. The road cited has but one pattern of shoe and two patterns for head on the whole system. To do this it was necessary to revise all the brake rigging, but the results on all cars have amply proved the wisdom of the change, which was made in such a way as not to require the removal of the brakehead to remove or apply a shoe, which is a very simple and quick operation.

Figures 13 to 17 show what can be done with the brake shoes for maximum traction trucks.

Figures 20, 21 and 22 show the change for the small shoe of maximum traction truck. Figures 23 to 25 inclusive, show separate heads, which take a common shoe, noted as Figure 16, weighing 24 pounds.

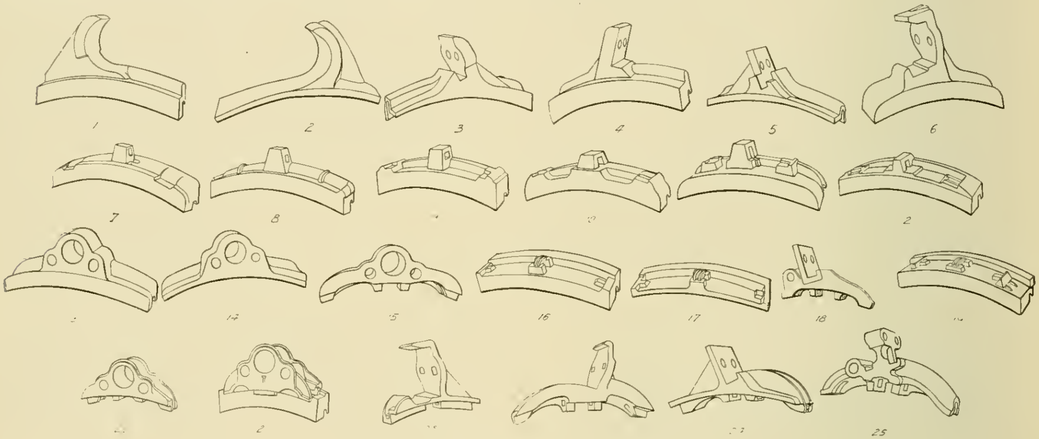
The following serves to illustrate the comparison. Several types of combined head and shoe cost, approximately, as shown in the table:

Weight new, lb.	Cost at 2½c	Scrap lb.	Value at .6c	Net Cost
30	$0.75	15	$.09	$.66
27	.68	14	.08	.60
32	.78	16	.09	.69
37	.92	18	.11	.81
40	1.00	20	.12	.88
36	.90	18	.11	.79
Mean				.75

For the separate head and shoe the costs would be: Cost of malleable head, $1.00; cost of key, $.05; cost of standard shoe, 24-pound, at 2½ cents, $.60; total, head and shoe, new, $1.65. Value of scrap shoe, 6½ pounds, at .6 cents, $.04. Net cost of brake shoe, $.56.

The first equipment will cost $1.65 for separate head and shoe against $0.84 for the average combined head and shoe. Allowing for scrap these reduce to $1.61 for the former and $0.75 for the latter, as net cost for the shoe. The difference is $0.86 and the saving in each new separate shoe applied is 19 cents, and the brakehead will be nearly paid for when five shoes have been worn out. The actual results will be much better than this, for there will be a saving in stock carried and in the cost of brake shoe maintenance generally, by the adoption of a common standard.

Referring to the illustrations which are reproduced from tracings of photographs of heads and shoes, some of the latter new and some worn out in regular service, the weights are: Figure 1, new, 54 pounds. Figure 2, scrap, 34 pounds. Figure 3, scrap, 23 pounds. Figure 4, new, 40 pounds. Figure 5, scrap, 20 pounds. Figure 6, new, 36 pounds. Figure 7, 23½ pounds. Figure 8, 22¼ pounds Figure 9, 30¼ pounds. Figure 11, 31 pounds. Figure 12, 22 pounds. Figure 13, new, 27 pounds. Figure 14, same shoe, scrap, 17 pounds. Figure 15, separate head, new, 9 pounds. Figure 16, standard shoe for head shown in Figure 15, new, 24 pounds. Figure 17, same shoe, scrap, 6 pounds. Figure 20, separate head, 7 pounds. Figure 21, same head with 14-pound shoe. Figure 22, separate head, 7 pounds, to take 14-pound shoe. Figure 23, 24 and 25, separate heads weighing 12 to 12½ pounds, to take 24-pound shoe like Figure 16, which can be scrapped at 6 pounds.



Types of Electric Railway Brake Shoes.

ECONOMIZERS IN STREET RAILWAY POWER PLANTS.

For the following discussion as to the saving that can be effected in power plant operation by means of fuel economizer we are indebted to the Green Fuel Economizer Company, of Matteawan, N. Y.

The load of a street railway power plant may be assumed to be distributed somewhat as follows: Midnight to 6 a. m., 12½ percent of full load; 6 to 8 a. m., 55 per cent; 8 a. m. to 5 p. m., 38¾ per cent; 5 to 8 p. m., 100 per cent, and 6 p. m. to midnight, 25 per cent. During the heaviest part of the day the load may be expected to exceed at times the full load rating of the engines and generators by 25 per cent. As a more concrete example there may be taken a station of 8,000 kw. full load capacity. Such a station might be provided with a 5,000 kw. generating unit and one of 3,000 kw., both to be used for the peak load and one or the other for the remaining periods. This makes it possible to run the engines at fair efficiency most of the time.

Boilers cannot be brought into service and laid off again as easily as engines and generators, but on the other hand, a boiler plant, if properly designed, will carry overloads for long periods. To put in boilers enough to handle the peak load at the usual rating of 3 pounds of water evaporated from and at 212 degrees per square foot of heating surface per hour would require an excessive outlay.

In the example, if 20 pounds of steam per kilowatt-hour be assumed the boiler output at full load would be 5,333 hp. However, if there is good draft this load may be easily carried by boilers of 3,200 hp. nominal capacity and when being driven at this rate they will realize about 92 per cent of their efficiency at nominal full load. The boilers in a plant of this size would be divided into two equal batteries, one only serving during the period of light load, that is, from 8 p. m. to 6 a. m.

The boiler horsepower required for the average of the 24 hours would be 2,067. If economizers be installed at the rate of 5 square feet of surface for each boiler horsepower of the average load and divided into two units, one operated in connection with each of the boiler batteries, the following results may be expected:

With an average temperature of the water entering the economizer of 150 degrees F., due to preheating by the steam from auxiliaries exhausting into open or closed heaters, the economizer will raise the feed water 78 degrees, as an average for the 24 hours. If the initial temperature of the water is 200 degrees, the rise due to the economizers will be 68 degrees.

For the 78 degrees rise the heat saved will amount to 7.2 per cent of that received by the boilers from the coal burned; for 68 degrees the saving will be 6.6 per cent. Since the daily average load is 3,100 kw., the coal burned will be 6,889 pounds per hour, or 21,000 long tons per year, 7.2 per cent ot which is 1,940 tons. If the coal costs $3.00 per ton, the saving is $5,820. The cost of the economizer surface at $1.00 per square foot is $10,335, of which $5,820 is 56 per cent. That is, the economizer will save at the annual rate of 56 per cent on the investment. For 6.6 per cent. saving of heat, the returns on the economizer are 51 per cent.

Again, it may be supposed that economizer horsepower surface is installed at the rate of 5 square feet per boiler horsepower for the average load during the 14 hours from 6 a. m. to 8 p. m., which is 2,890 boiler horsepower. The economizer surface would then be 14,450 square feet. With an initial temperature of water of 150 degrees the rise due to the economizer would be 97.5 degrees, or with an initial temperature of 200 degrees it would be 84 degrees, the first giving a saving of 9 per cent and the second one of 8.15 per cent. The value of the coal saved in the first case would be $7,290, which is 50 per cent of the cost of the economizer. In the second case, the value of the coal saved would be $6,600, which is 45 per cent of the cost of the economizer.

In assuming these examples, conditions especially favorable to economizers have not been selected. For instance, it will be noticed that the feed water is assumed to have been heated to 150 and 200 degrees F. by the exhaust of the auxiliaries before entering the economizers. With motor-driven auxiliaries and the economizers receiving their supply from the condenser hot well, a much larger saving by the economizers would be shown. The boiler capacity chosen is about what would be found in a plant of this kind, and it should be remarked that while economizer surface costs less than boiler surface, square foot for square foot, its efficiency in transferring heat from the gases outside to the water inside is greater, due both to the greater average difference in temperature and the fact that the economizer surface is kept free of soot by automatic scrapers.

Mechanical draft is a valuable, if not an essential, part of any boiler plant run in the manner described. By its use the boilers can be permanently operated at 30 to 40 per cent above the nominal rating, or even at twice this rating, if necessary. With better and easily controllable draft, better furnace conditions are realized; there is less excess of air, and better combustion. With a strong draft, inferior fuels may be burned and, with proper firing or mechanical stokers, without smoke. Finally, mechanical draft renders the working of the boiler plant independent of weather conditions, which is specially important where the temperature of the flue gases is greatly reduced by economizers. Mechanical draft makes it possible to realize the value of the economizers fully. Both mechanical draft and economizers help the plant to carry heavy and sudden overloads, mechanical draft by quickly increasing the rate of combustion, the economizers by holding a large body of hot water in storage outside the boilers.

THE BALDWIN LOCOMOTIVE WORKS.

The Baldwin Locomotive Works was founded in 1831 by Matthias W. Baldwin, whose first locomotive for road service was tried under steam on November 23, 1832. In 1831, Mr. Baldwin, who had had some experience in building stationary engines, constructed a successful working model of a locomotive for the Philadelphia Museum. In the same year he received an order from the Philadelphia, Germantown & Norristown Railroad, for a locomotive to operate between Philadelphia and Germantown, a distance of six miles. This locomotive, the "Old Ironsides," was successfully tried on the date previously mentioned.

During the next few years many railways were projected and built, and Mr. Baldwin received orders for additional locomotives. With the steady growth of business the plant was enlarged reaching its present proportions after 75 years of continuous operation. During this period over 29,000 locomotives have been constructed. The heaviest of these engines weighs, exclusive of its tender, about one hundred and seventy-seven tons. The weight of the "Old Ironsides" was between five and six tons. The present annual capacity of the works is 2,500 locomotives.

A large tract of land has recently been purchased at Eddystone, Pa., where foundries and smith shops are being erected, thus providing increased facilities. The amount paid out in wages is about $250,000 per week, or a total of $13,000,000 annually. Other interesting data relative to the present plant are as follows:

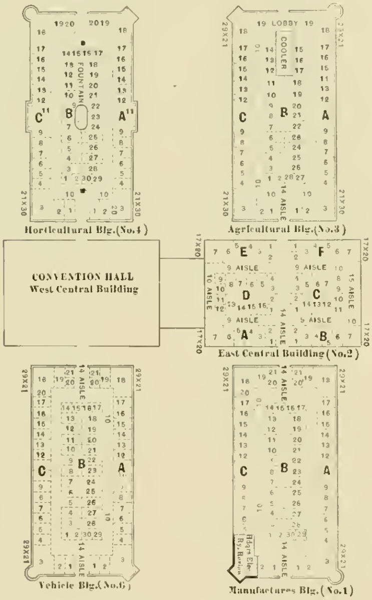
Number of men employed	19,000
Hours of labor per man per day	10
Principal departments run, in two shifts, hours per day	23
Horse power employed	13,000
Number of buildings comprised in the works	49
Acreage comprised in the Philadelphia works	17.8
Acreage comprised in the Eddystone works	183
Acreage of floor space comprised in the buildings	47
Horse power of electric motors employed for power transmission	12,000
Number of electric motors in service	990
Consumption of coal, in net tons, per week, about	2,100

THE LIST OF EXHIBITS.

With each succeeding year, the exhibits at the annual conventions of the street railway associations multiply and increase, and each year it seems as if the expansion in size and number had reached the limit of the natural possibilities of such exhibitions. But the display now to be seen at the Fair Grounds is larger than that ever shown at any previous convention.

The exhibits are located in a group of buildings near the center of the Fair Grounds, and, with the convention hall, occupy six large structures embracing over one hundred thousand square feet of space. The track exhibits are under cover nearby, and the entire lay-out is such as to make each individual exhibit as prominent and accessible as one could desire.

Considering the large amount of work involved, the condition of the exhibits this morning is most gratifying. There is yet some work to be done in finishing up the installation, but it is fair to expect that by tomorrow morning, the final touches will have been placed upon those exhibits that are not yet completed.



Floor Plan of Exhibit Buildings.

There is but one entrance, which will serve also as an exit, to the exhibit buildings and to the convention hall, and that is through building No. 1, as shown in the accompanying diagram. In order to reach the main convention hall, it is necessary to go through buildings Nos. 1, 2, 3 and 4, and the exit is back over the same route.

In the following list, we have given as complete a statement as was possible at the hour of going to press, showing in each case the name of the exhibitor, the location of the exhibit, an enumeration of the articles on display, and the names of the representatives in attendance. The lay-out of the exhibits will be readily understood by reference to the diagram. Each building is divided into three or more sections, indicated as A, B, C, etc., and each section is divided into spaces numerically described. In the following list, the location is given with the building number first, followed by the section, and that by the number of the spaces in the section. The following list will be repeated in later numbers, and our friends will confer a favor by calling our attention to any errors or omissions that may come to their notice.

Acme Automatic Street Indicating Company, Cleveland, O.—Building 4, Section A, Space 10-11.—Display, working from electric push button of a number of Acme automatic street indicators, revolving capacity 1,000 stations per indicator. Represented by Major C. W. Johnson, Peter Small, T. W. Small and Frank Brueggeman.

Adams & Westlake Company, Chicago—Building 4, Section B, Space 26-27.—Signal lamps, headlights, car-trimmings, brake-handles, switch-lamps, electroliers. Represented by Fred B. Jones, G. L. Walters and Wm. J. Piersen.

Allis-Chalmers Company, Milwaukee, Wis.—Building 3, Section A.—Machinery and large framed photographs illustrative of complete electric railway equipments—for power houses, sub-stations, cars, and lines, including Christensen air-brake apparatus; supplemented by bulletins; also model showing the stationary and movable blading of an Allis-Chalmers steam turbine. Represented by F. C. Randall, W. S. Doran, W. W. Power, F. C. Colwell, M. W. Thomas, W. J. Buckley, J. W. Gardner, J. W. Murray, W. T. McCaskey, J. H. Denton, Geo. Voigt, G. B. Foster, W. S. Heger, A. H. Whiteside, H. A. Strauss, H. A. Buell and C. A. Tupper.

American Advertising Indicator Company, St. Joseph, Mo.—Building 6, Section A, Space 20.—American Advertising Indicator. Represented by Graham Burnham, Gerald Livergood and Clifton George.

American Brake Company—See Westinghouse.

American Brake Shoe & Foundry Company, Mahwah, N. J.—Building 3, Section B, Spaces 9-10.—Brakeshoes and brakeheads. Represented by W. S. McGowan, F. W. Sargent, E. L. Janes, F. L. Gordon, R. T. Hatch and J. S. Thompson.

American Car Company, St. Louis.—Machinery Hall—See J. G. Brill Company.

American Instrument Company, Philadelphia, Pa.—Building 3, Section B, Space 6.—American high-grade direct-current volumeters and armeters, both switchboard and portable types. Represented by James G. Biddle, A. O. Benecke, T. G. Seixas and A. B. Weeks.

American Locomotive Company, New York.—Machinery Hall.—Motor trucks built for the New York Central & Hudson River Railroad to be equipped with two motors of 200 horse power each, to be supplied by the General Electric Company; load on center plate 40,000 pounds, weight of motors 15,300 pounds, weight of truck and motors 27,700 pounds; one trailer truck for the same company, load on center plate 38,000 pounds, weight complete 11,000 pounds. Represented by Wm. Wampler.

American Mason Safety Tread Company, Empire Safety Tread Company, Boston.—Mason safety tread for car steps, Empire carborundum safety tread. Represented by Henry C. King and J. W. Scott.

American Railway Supply Company, New York—Building 1, Section B, Space 1.—Badges for conductors and motormen. Represented by Walter Chur.

American Sewer Pipe Company, Pittsburg—Building 6, Section B, Space 25.—Sewer Pipe.

American Steel & Wire Company, Chicago, Ill.—Building 4, Section C, Space 16-17.—Rail bonds, wire, trolley wire, wire fence and a complete line of rail bonding tools. Represented by George Cragin, C. S. Marshall, F. A. Keys, C. S. Knight, B. B. Ayers, R. K. Sheppard, J. D. Sutherland, E. Banchards, George Long, George Chandler, Henry Pratt, C. R. Sturdevant, J. M. Holloway and Thomas Lavin.

American Water Softener Company, Philadelphia, Pa.—Building 6, Section B, Space 24.—Working model of water-softening plant and photographs of plants that have been installed. Represented by A. S. Garrett, W. H. P. Fisher, A. W. Bartlett and Hugh Dunlavey.

Anderson Manufacturing Company, Albert and J. M., Boston, Mass.—Building 3, Section B, Space 23.—Trolley line material, Anderson time switch, Anderson knife switches. Represented by Ernest Woltmann, William W. Hincher and J. M. Anderson.

Atha Steel Casting Company, Newark, N. J.—Building 3, Section A, Space 9.—Titian gear wheels. Represented by Louis A. Shepard.

Atlas Railway Supply Company, Chicago, Ill.—Building 4, Section B, Space 28.—Atlas supported and suspended rail joints for tee and girder rails, Atlas compromise or step points, special rail joints, plain braces and tie plate braces, tie plates, switch stands and primer and surfacer for passenger cars. Represented by J. G. McMichael and D. Thomson.

Bache & Company, Semon, New York.—Building 3, Section B, Space 7.—Glass, mirrors, signal glass. Represented by F. J. Goertner and H. C. Fechheimer.

Baker Art Gallery, Columbus.—Building 6, Section A, Space 11.—Commercial photographs. Represented by D. N. Baker.

Baldwin Locomotive Works (Burnham, Williams & Company), Philadelphia, Pa.—Building 1, Section A, Space 5-6.—One truck in this space, four trucks under cars in Niles exhibit and two trucks under cars in Jewett exhibit. Represented by John R. Dickey and Warren Thorpe.

Baldwin Steel Company, New York—Building 2, Section D, Spaces 8-9-10.—Hudson high-speed steel, twist drills, gear cutters, milling cutters, taps, reamers, end mills, metal slitting saws. Represented by W. L. Stone, T. S. Hanna and H. L. Raynor.

Baldwin & Rowland Switch & Signal Company, New Haven, Conn—Building 6, Section B, Space 20.—A recording signal operated automatically Represented by H. Rowland and George A. Simonds

Bayonet Trolley Harp Company, Springfield, O.—Building 4, Section B, Space 17.—Bayonet detachable trolley harps and harp supplies, "Butterfly" sleet-cutters, Bayonet detachable trolley-pole clamps and arms. Represented by Jacob M. Olinger, R. A. Garlough and C. S. Olinger.

Berry Brothers, Detroit, Mich.—Building 4, Section C, Space 10.—Panels finished with inside and outside coach varnishes. Represented by William Stridiron, Thomas Lawler and Frederick W. Hormann.

Bird & Son, F. W., East Walpole, Mass.—Building 6, Section C, Space 10.—Paroid roofing, Neponset waterproof papers for sheathing purposes, special papers. Represented by Frank Lowe.

Blake Signal & Manufacturing Company, Boston, Mass.—Building 3, Section A, Space 10.—Blake signal. Represented by C. C. Blake and E. J. Burke.

Bowser & Co., S. F., Fort Wayne, Ind.—Building 4.—Oil storage systems, oil tanks and pumps, self-measuring oil tanks. Represented by C. A. Dunkelberg and W. T. Simpson.

Brady Brass Company, Jersey City, N. J.—Building 1, Section B, Spaces 18-19.—Motor bearings for electric railways. Represented by Daniel M. Brady, George C. Morse, Chas M. Reubens and W. F. Kranz.

Brill Company, J. G., Philadelphia.—Machinery Hall.—G. C. Kuhlman Car Company, Cleveland, American Car Company, St. Louis, and Stephenson Car Company, Elizabeth, N. J.—Various styles of cars made by these companies, among them two "Pay as you enter cars" built for the Montreal Street Railway Company. One of these cars was built by the Montreal Street Railway Company and is exhibited in the Brill exhibit, the other car was built at the G. C. Kuhlman Works, one 30-foot single-end Brill semi-convertible car built for the Toledo Railway & Light Company, one 50-foot combination baggage, smoker and passenger car built by the American Car Company; one combination steel car built by the J. G. Brill Company for the Boston Subway, one Brill 20-foot full convertible car built by the American Car Company; in addition to these cars is shown a Brill 27-F. E. No. 1 truck, Brill 27-E, No. 2 solid forged frame trucks and other specialities. Represented by S. M. Curwen, W. H. Heulings, Jr., Geo. M. Haskell, Geo. H. Tontrup, F. L Markham, D. B. Dean, Elwood Brill, Bryon O. Brill and Fred Brill.

Brown, Harold P., New York—Building 3, Section B, Spaces 3-4-5.—Plastic rail bond, plastic plug rail bond, solid copper rail bond, Brown electrical contact alloys, hand power rail grinders, flexible shafts, high-speed electric rail drill, pneumatic rail drill, magnetic drill clamp, electrical testing bureau with 3,000 amperes capacity, insulated third rail, amalgamated switch contacts. Represented by Harold P. Brown, Chris. Eccles, Robert K. Fast, F. Bissel, F. H. Brown, James Hollowood, Julius Alsberg, C. B. Coates, Geo. M. Hoadley, Albert Temple, John Roach and J. M. Coote.

Buckeye Engine Company, Salem, O.—Building 4, Section B, Space 1.—Engine model. Represented by C. H. Weeks, V. T. Price and G. W. Pope.

Buhne Metal Packing Company, New York.—Building 6, Section A, Space 5.—Fibrous Babbett steam packing. Represented by T. M. Remington.

Burroughs Adding Machine Company, Detroit—Building 6, Section A, Space 2.—Adding machines.

Calman & Company, Emil, New York—Ohmlac coils insulated with solid compound. Represented by H. Lee Bragg and W. A. Conway.

Cambre Steel Company, Pittsburg, Pa.—Building 2, Section C, Space 1.—100 per cent rail joint, 100 per cent insulated rail joint, T-rail guards for street railway use. Represented by A. Morrison, J. L. Replogle, H. P. Hubbell, J. L. Adams, C. J. Ellis and E D. Rogers.

Capital Lock-Nut & Washer Company, Columbus.—Building 6, Section B, Space 8.—Lock-nuts, bolts, nuts and structural rivets. Represented by L. R. Ayers and T. H. Ryan.

Carnegie Steel Company, Pittsburg, Pa.—Building 2, Section A, Space 17.—Complete girder rail branch off, mounted on complete set of steel switch ties, steel cross-ties. Represented by W. P. Siebert, N. M. Hench, L. C. Lustenberger, F. W. Highberger, A. M. Harper, W. A. Bostwick, John E. Woods, R. A. Bruce, R. H. Graham, K. E. Porter, F. C. Deming and F. C. Brunke.

Cary Automatic Couplers Company, Chicago—Building 6, Section A, Space 21.—Cary automatic car couplers and Cary automatic train-pipe couplers. Represented by Clarence W. Taylor and Boleslaw R. Kozlowski.

Chase Foundry & Manufacturing Company, The, Columbus, Ohio—Building 6, Section B, Spaces 21-22-23.—Express and baggage wagons, factory and railroad trucks and industrial cars. Represented by S M. Chase and W. C. Stocklin.

Chase-Shawmut Company, Newburyport, Mass.—Building 6, Section C, Space 8.—Shawmut soldered rail bonds. Represented by Frank D. Masterson.

Chicago Pneumatic Tool Company, Chicago.—Building 3, Section B, Space 3-4-5.—Electric drills and grinders for rail bonding wound for line voltage, and a complete line of pneumatic drills and hammers. Represented by J. W. Duntley, W. O. Duntley, C. E. Walker, C. B. Coates and Edward Aplin.

Cincinnati Car Company, Cincinnati, O.—One 61-foot 6-inch interurban buffet car. Represented by H. C. Ebert.

Cleveland Frog & Crossing Company, Cleveland.—Building 2, Section C, Space 7-8-9.—Mate switch and frog; steam frog, rigid center; derailing switch, ground stand, double spring frog sample rail, also mechanism operating the derailing switch. Represented by Geo. Stanton, Geo. C. Lucas and E. D. Powell.

Climax Stock Guard Company, Chicago, Ill. and Canton, O.—Building 6, Section B, Space 15.—Climax "Clay" cattle guards, farm crossing gates. Represented by Fred V. Stewart and F. W. Stewart.

Columbia Machine Works & Malleable Iron Company, Brooklyn, N. Y.—Building 6, Sections 16-17, Space C.—Armature pinion puller, armature buggy, broom-filling table, snow-sweeper broom, babbitt moulds. Represented by John G. Buehler and W. R. Kerschner.

Consolidated Car Fender Company, Providence, R. I.—Building 4, Section A, Space 8-9.—Car fenders, snow brooms, car-step lifters. Represented by George Hollingsworth.

Consolidated Car Heating Company, New York—Building 4, Section C, Space 4-7.—Electric car heaters, portable vestibule heater, switches for electric heaters, switches for car lights,. switchboards. Represented by Cornell S. Hawley, S. Butler Keys, W. S. Hammond, jr., and F. W. Brownell.

Consolidated Engine Stop Company, New York—Building 6, Section B, Space 2.—Monarch system of automatic devices, consisting of engine stops, for steam, gas or oil engines, steam turbines and water wheels, engine stop operated by gravity, by steam pressure, also electric motor, automatic vacuum breakers, automatic safety breaker trips, automatic push switch, Monarch testing system for engine stops and automatic devices. Represented by Arnold W. Lenderoth and Harry W. Quackenbush.

Cook Manufacturing Company, C. Lee, Louisville, Ky.—Building 6, Section C, Space 9.—Cook's metallic packing for piston rods and Corliss valve stems for both saturated and superheated steam. Represented by C. Lee Cook and Robert C. Baldwin.

Cook's Railway Appliance Company, Kalamazoo, Mich.—Building 4, Section A, Spaces 14-15.—Standard track and car, automatic lowering jacks, cattle guards, rail drills, tool grinders. Represented by Harry W. Russell and Eugene Cook.

Cooper-Hewitt Electric Company—See Westinghouse.

Creaghead Engineering Company, The, Cincinnati, O.—Building 1, Section C, Spaces 10-11-12.—Creaghead flexible brackets, Creaghead day and night car signs, Bourbon strain insulators, trolley-line materials, pole line fittings, glass porcelain insulators, Creaghead high-tension insulator pins. Represented by T. J. Creaghead and C. Johnson.

Crouse-Hinds Company, Syracuse, N. Y.—Building 6, Section B, Space 10-11-12-13.—Imperial arc headlights and combination, arc and incandescent headlights, Syracuse changeable incandescent headlights. Harpoon guy anchors, Norbitt porcelain specialties, condulets. Represented by A. F. Hills, N. Shute, F. F. Skeel and C. M. Crofoot.

Curtain Supply Company, Chicago—Building 1, Section B, Space 10-11.—Curtains for closed cars equipped with Forsyth No. 86, Ring No. 88, eccentric Acme cable and Climax cable fixtures, also ring fixture No. 49, adapted for semi-convertible cars, curtains for open cars equipped with Acme, Climax and Forsyth cable fixtures and ring fixture with projecting pins and metal retaining strip. Represented by W. H. Forsyth, A. L. Whipple and R. F. Hayes.

Davis Pressed Steel Company, Wilmington, Del.—Building 6, Section B, Space 29.—Davis brake beam bar, solid truss, solid-truss brake beam with vertical strut, especially adapted to electric railway service, solid truss brake beam with 40-feet strut, solid-truss high-speed-brake beam. Represented by W. C. DuComb, jr.

Dayton Manufacturing Company, The, Dayton, O.—Building 3, Section B, Space 1.—Car trimmings, brake handles, arc headlights, sash locks, incandescent headlights. Simmons-Moore Sander. Represented by John Kirby, Jr., Nelson Emmons, Jr., Peter Leidenger, Geo. W. Frost and Ed. L. Spencer.

Dearborn Drug and Chemical Works, Chicago, Ill.—Building 4, Section A, Space 12-13.—Water purifying preparations, lubricating oils and greases. Represented by Robt. F. Carr, Grant W. Spear, Dan Delaney, Paul T. Payne and W O. Clark.

Dixon Crucible Company, Joseph, Jersey City, N. J.—Building 4, Section C, Spaces 19-20.—Silica-graphite paint, pipe-joint compound, American graphite pencils, commutator compound, Ticonderoga flake graphite lubricants, graphite greases, plumbago crucibles, foundry facings, motor brushes. Represented by Charles H. Spotts, F. R. Brandon and L. H. Snyder.

Dossert & Company, New York—Building 3, Section A, Space 8.—Solderless connectors or mechanical splicing joints for electrical wires and cables; tap joints, terminal lugs, motor leads, rail bonds, meter connections, transformer connections, grounding devices, three-way, four-way and wye connectors; flat or front lugs, center or back lugs, service box plugs, insulated connectors. Represented by Harry B. Logan and E. A. Dossert.

Duff Manufacturing Company, The, Allegheny, Pa.—Building 1, Section A, Space 9.—Barrett lever jacks, including trip jacks, automatic lowering jacks and geared ratchet jacks. Barrett motor armature lifts, Duff roller-bearing screw jacks, Duff cone bearing screw jacks, traversing jack bases. Represented by Geo. A. Edgin.

Duplicate Transfer & Rebate Company, Philadelphia, Pa.—Building 1, Section B, Space 9.—Secret service work. Represented by H. N. Brown, T. C. Cary and Chas. Goble.

Earll, Charles I., New York—Building 3, Section B, Space 8.—Trolley retrievers. Represented by C. I. Earll, C. A. Coutan and E. Miller.

Eclipse Railway Supply Company, Cleveland, O.—Building 3, Section B, Spaces 21-22.—Car fenders. Represented by Martyn Bonnell, Ross Forward and Benj. Lev.

Edwards Company, O. M., Syracuse, N. Y.—Building 1, Section C, Spaces 5-6-7.—Models showing 25 designs of window fixtures and 9 designs of extension trap-door fixtures, exhibit of tin barrel spring rollers, sash balances and window fixture hardware. Represented by G. E. Bake, Edward F. Chaffee, O. M. Edwards, Franklyn M. Nicholl and Geo. G. Norris.

Electric Railway Improvement Company, Cleveland, O.—Building 6, Section A, Space 17.—Bond-welding car, motor-power grinder. Represented by C. L. Cadle and J. A. Cadle.

Electrical Review, New York—Building 4, Section A, Space 17½.—Copies of the publication.

Elliott Bros. Electric Company, Cleveland—Building 4, Section B, Space 25½.—Field coils, armature coils, commutators.

Electric Service Supplies Company, Philadelphia, Pa., Keokuk, Ia., Chicago, Ill.—Building 1, Section A, Spaces 13-21.—Protected rail bonds, rail-bond compressors, Keystone overhead insulation, Keystone ears, Lyon sheet-steel gear cases, automotoneers, Garton-Daniels lightning arresters, pole brackets and fittings, third-rail insulators, Keystone car-vestibule shades, Mayer & Englund telephones, Keystone cable racks, Philadelphia car fenders, Brady bearings, sweeper rattan, testing instruments, construction and linemen's tools, high-tension malleable pins, portable lamp guards. Represented by C. J. Mayer, A. H. Englund, J. W. Porter, M. A. Berg, J. V. E. Titus, E. R. Mason, W. P. Cosper, G. W. Cox, J. M. Gallagher, Ernest Boehme, W D. Hamer, Hugh L. Adams, Wm. A. Armstrong, Jr., Frank B. Massey, Henry R. Swartley, Jr., Edward Hammett, Jr. and Robert Montgomery.

Electric Storage Battery Company, The, Philadelphia, Pa.—Building 1, Section C, Space 17-18-19.—Two type R-cells, one containing 55 plates, the other 83, carbon regulator, compensating hydrometer, signaling hydrometer, recording hydrometer, automatic cell filler, several Manchester positive asd box negative plates mounted on boards. Represented by C. Blizzard, H. B. Gay and G. H. Atkins.

Fay, J. A., & Egan Company, Cincinnati—Building 6, Section A, Space 10.—Hollow chisel mortiser, special square column band saw, both electrically driven. Represented by Jas. J. Sexton and Clifford P. Egan.

Felt & Tarant Manufacturing Company, Chicago, Ill.—Building 4, Section C, Space 14.—Latest model "1907 Improved" Duplex comptometer. Represented by L. A. de Berard, J. B. Cooper, C. C. Baum and Walter E. Zehring.

Franklin Car Heating Company, Syracuse, N. Y.—Building 4, Section B, Space 29-30.—Numbers 2 and 3 water jacket car heaters, and numbers 4, 4-A and 5, air jacket car heaters; The Franklin Car Heating Company also has an exhibit in the Machinery Hall next to the Niles car. In this is shown in operation a pneumatic trolley retriever which was in use during the winter on the Columbus & Springfield Railway. Represented by Kenneth D. Hequembourg, E. S. Caylor, R. H. Carroll and Charles Reed.

Franklin Electric Manufacturing Company, Hartford, Conn.—Building 4, Section B, Space 30.—Vibration test of the Franklin street railway lamps, standard, reflector and miniature lamps. Represented by P. S. Klees, C. N. Thorpe, C. Leonard and F. E. Wilson.

D. & W. Fuse Company, Providence, R. I.—Building 4, Section B, Space 10.—Deltabeston magnet wire, enclosed cartridge fuses, enclosed fuse cut-outs and boxes. Represented by W. S. Sisson and C. E. Harmon.

Galena-Signal Oil Company, Franklin, Pa.—Building 4, Section A, Space 1-2-3.—Samples of lubricating oils. Represented by L. G. Miller, George A. Barnes, Edwin H. Baker, E. G. Beatty, S. J. Drake, John C. Glair, Alfred Green, J. E. Hall, H. A. Mason, J. S. Patterson, C. A. Record, George J. Smith, J. V. Smith, W. A. Stieff, C. E. Schauffler, C. H. Thomas, W. A. Trubee, William J. Walsh, William P. Westcott and E. B. Wilson.

W. R. Garton Company, Chicago, Ill.—Building 3, Section B, Space 24.—Railway supplies including porcelain high-tension insulators, gears and pinions, assembled commutator bars, armature and field coils, tape, insulating compounds, telephones, insulator pins and brackets, overhead material, rail bonds, lightning arresters and ground or guy anchors. Represented by W. R. Garton, C. C. Ewing, L. E. Berebaum and H. M. Kennedy.

General Electric Company, Schenectady, N. Y.—Building 3, Section A, Space 11-19.—Quadruple GEA 605 single phase car equipment complete with type "M" control for operation on DC-AC circuits, mounted on frame and representing the under side of a car body, complete emergency straight-air brake equipment for motor car and similar equipment for trail car mounted on rack and operated together, GE-100 railway motor; GE-80 railway motor, operating exhibit of K28 and "F" controller arranged to show operation of contractors on rack, mercury arc rectifier outfit complete and operating incandescent lighting circuits of the exhibit space, portable air compressor outfit with CP-22 compressor, full exhibit of latest type catenary and standard direct-current overhead line railway material, new type high-candlepower Gem units and tantalum lamps, standard railway supplies and line materials. Represented by J. R. Lovejoy, W. J. Clark, J. G. Barry, C. C. Pierce, G. D. Rosenthal, A. B. Shepard, H. L. Monroe, R. E. Moore, E. H. Ginn, H. H. Crowell, F. A. Larkin, C. E.

Barry, H. N. Ransom, E. D. Priest, A. H. Armstrong, W. G. Carey. F. E. Case and F. H. Gale.

General Systems Company, Dayton, O.—Building 3, Section B, Space 28.—Egry system of train dispatching, Egry system of railway way-billing special systems devised for use in the operating, constructing and maintenance of the various departments of railway service. Represented by Milton C. Stern, William L. Egry and James Josephi.

Gibbs Counting Machine Company, Zanesville, O.—Building 1, Section B, Space 22.—Counting machines for railroad offices. Represented by John C. Sullivan and W. A. Gibbs.

Globe Ticket Company, Philadelphia—Building 1, Section B, Space 8.—Street and interurban railway tickets and transfers, "Globe" power ticket destroyer in operation. Represented by W. C. Pope, P. C. Snow, R. C. Osman and W. P. Snow.

Gold Car Heating & Lighting Company—Building 4, Section A, Spaces 5-6-7.—Gold's improved electric heaters for car heating and other purposes, panel heaters, riser-board heaters, cross-seat heaters, temperature-regulating devices, systems of hot-water circulation for use in interurban cars. Represented by Edward E. Gold, John E. Ward, A. E. Robbins and F. A. Purdy.

Goldschmidt Thermit Company, New York—Building 1, Section A, Spaces 7-8.—Thermit and appliances used in welding; also rare metals made by the alumino-thermic process; daily demonstrations of compromise joints. Represented by R. F. Kelker and George E. Pellissier.

Griffin Wheel Company, Chicago, Ill.—Building 2, Section D, Space 4.—Car wheels. Represented by Charles K. Knickerbocker.

Grip Nut Company, Chicago—Building 2, Section D, Space 3.—Grip lock nuts. Represented by B. F. Stewart, W. S. Wickerman and E. R. Hibbard.

F. P. Harrison Electric Manufacturing Company, Inc., N. Y.—Building 4, Section B, Space 10 1-2.—Deltabeston armature and field coils; also D. C. C. armature and field coils. Represented by F. P. Harrison and A. E. Meixell.

Hale & Kilburn Manufacturing Company, Philadelphia.—Building 4, Section B, Space 5.—Rattan in large rolls, also as a panel on three sides of exhibit, four styles of seats with pressed-steel seamless pedestals, small chairs used on private street cars and interurban cars, four steam railroad seats showing the latest design for street railroads which are similar but smaller. Represented by A. F. Old, H. T. Bigelow and S. A. Walker.

Harrison Safety Boiler Works, Philadelphia, Pa.—Building 6, Section B, Space 30.—Cochrane Feed-water heater, Cochrane separator, framed photographs of Cochrane heaters and separators. Represented by J. E. Harris.

Heany Fire Proof Wire Company, York, Pa.—Building 6, Section B, Space 14.—Heavy fire-proof insulated wire, armature field coils, and a demonstration of the ability of the insulation to withstand red heat indefinitely. Represented by Wm. H. Easton.

Heywood Brothers & Wakefield Company, Wakefield, Mass. and New York—Building 4, Section B, Space 2.—Interurban Wheeler car seat upholstered in green figured plush showing detachable back feature, Wheeler seat upholstered in rattan showing grab-handle and brass back-band, woven-rattan car-seat webbing, section of Wheeler mechanism operated by electric motor. Represented by Bertram Berry.

Home Rubber Company, Trenton, N. J.—Building 6, Section 5, Space 9.—N. B. O. sheet packing valves, hose and tubular gaskets; O. I. M. high and low diagonal rod packings, flax packings, hydraulic packing. Represented by Mr. A. R. Foley.

Indianapolis Switch & Frog Company, Springfield, O.—Building 2, Section D, Spaces 5-6.—Crossing of steam track with electric or interurban railway. Represented by W. H. Thomas and E. C. Price.

International Register Company, Chicago—Building 1, Section B, Space 12-13.—Registers and register fittings, conductors' badges and punches, cotton trolley cord. Represented by John Benham, A. L. Tucker, Wm. G Kirchhoff and A. N. Loper.

International Sprinkler Company, Philadelphia, Pa.—Building 1, Section C, Space 21.—Complete exhibit of the devices entering into the construction of an automatic sprinkler system. Represented by John C. Scott A. B. Gould and A. M. Lewis.

Interurban Railway Journal, Indianapolis—Building 1, Section B, Space 2.—Volumes of the paper. Represented by Geo. W. Warmoth.

Jenkins Automatic Fender Company, Toronto—Building 6, Section A, Space 14.—Automatic fender. Represented by B. B. Jenkins, Jas. H. Jenkins and J. B. White.

Jewett Car Company, Newark, Ohio.—Machinery Hall—New semi-convertible car, one Brooklyn Rapid Transit car, one Winona Interurban 60-foot combination passenger and smoker. Represented by E. Besuden.

Johns-Manville Company, H. W., New York—Building 4, Section C, Space 1-2-3.—Overhead line material, third rail insulators, asbestos transite doors for transformers, "Noark" enclosed fuses, blocks, service and subway boxes, car cut-out boxes, electric car heaters, trolley wheels and brass goods, transite asbestos for fireproofing electric cars. Represented by J. W. Perry, R. R. Braggins, A. D. Newton, H. M. Voorhis, F. E. Johnson, J. W. Hardy and A. A. Forshee.

Jones & Laughlin Steel Company, Pittsburg, Pa.—Building 2, Section C, Space 3.—Cold-rolled axles. Represented by Elmer D. Batchelor, George B. Mitchell and C. H. L'Hommedieu.

Kalamazoo Railway Supply Company, Kalmazoo, Mich.—Building 1, Section C, Space 13-14 15-16.—Root railway spring snow scrapers, Root railway spring fender, tower hand car, pressed steel wheels, ratchet jacks, friction jacks, three different styles of Moore track drills, Smith curve lining gauge. Represented by H. G. Haines, F. N. Root, J. W. Thorn and D. A. Moore.

Kennicott Water Softener Company, Chicago.—Building 4, Section B, Space 15.—Photographs and drawings of installations of water-softening plants. Represented by L. M. Booth, E. Richardson and Frank S. Dunham.

Keystone Brake Shoe Company, New York—Building 3, Section B, Space 18—Keystone brake shoes and heads. Represented by Charles H. Platt, George M. Hoadley and V. B. Lamb.

Kinnear Manufacturing Company, The, Columbus, O.—Building 3, Section B, Space 11.—Car-barn doors. Represented by E. H. McCloud, F. C. Schmidt, Henry G. Cox, S. R. Hewitt and H. E. Vance.

Kuhlman Car Company, Cleveland, O.—Machinery Hall—See J. G. Brill Company.

The Lagonda Manufacturing Company, Springfield, O.—Building 1, Section B, Space 20-21.—Weinl and tube cleaners, both turbine and power-driven, Lagonda tube cutters, damper regulators, reseating machines, automatic cut off valves. Represented by H. S. Bradley, H. F. Weinland, Hermon G. Weinland, Maurice Sellers and F. Stanley Davidson.

Lanning & Company, J. Frank, Pittsburg, Pa.—Building 6, Section C, Space 21.—Duplex combination headlight, Little Giant boring machine for babbitting, Chisholm & Moore chain hoists, F-M oil cups and Post's motor and Zero babbitt. Represented by J. Frank Lanning, C. E Sommers, C. A. Schettler, N. C. Lane, J. W. Neefus, A G. Maize and D. J. Lanning.

Liberty Bell Company, Bristol, Conn.—Building 3, Section B, Space 19.—Trolley harps, trolley wheels, bells. Represented by M. J. Horton and E. D. Rockwell.

Lorain Steel Company, The, Philadelphia, Pa.—Building 2, Section E, Space . . .—Special track work, girder and high tee rails. Represented by H. C. Evans, Carroll Burton, E. B. Entwisle, W. W. Kingston, A. S. Littlefield, S. P. McGough, F. J. Drake, S. P. S. Ellis, H. F. A. Kleinschmidt, H. B. Frye, Jr., and R. Clitz.

Lord Company, George W., Philadelphia, Pa.—Building 4, Section B, Space 25.—Lord's boiler compounds. Represented by Edward McCarthy, Col. Nat P. Lane and V. O. Lawrence.

Lord Electric Company, Boston, Mass.—Building 3, Section B, Space 25.—Thomas soldered rail bonds, Shaw nonarcing lighting arresters Represented by Edwin M. Hamlin, Geo. B. Crane and Geo. W. Smith.

Lumen Bearing Company, Buffalo, N. Y.—Building 2, Section D, Space 2.—Ideal trolley wheels, motor axle-bearings, truck bearings. Represented by E. P. Sharp and C. W. Stimpson.

Macdonald Ticket & Ticket Box Company, Cleveland, O.—Building 3, Section B, Space 2.—Macdonald cash receipt holder. Represented by Murdock Macdonald.

Magann Air Brake Company, Ltd., Detroit, Mich., and Toronto, Can.—Building 6, Section C, Space 12-13-14-15.—Motor and chain-drive tandem-compound air compressor with automatic starter and pressure regulator, floor framing of car with trucks, showing brakes in operation, automatic cut-off charging valve, hose couplings, rubber-seated ball check valve. Represented by W. K. Omick, F. Y. Harrison and Richard Kroll.

Massachusetts Chemical Company, Walpole, Mass.—Building 1, Section B, Space 10½.—Insulating specialties; Armalac, special Armalac, M. C. No. 50 insulating compound, M. C. waterproof paints, enamelac, cable and transformer waxes, friction tapes and splicing compounds, M. C. weatherproof tape, rubber moulded specialties, field tape, field coil cushions. Represented by E. C. Green, A. T. Baldwin, R. T. Elwell, L. O. Duclos, A. E. Duclos.

Masury & Son, John W., New York, Chicago, St. Louis, Minneapolis.—Building 4, Section C, Space 8.—Panels decorated with seals of eleven states. Represented by T. J. Ronan and F. P. Hill.

Matthews & Brother, W. N., St. Louis, Mo.—Building 6, Section B, Space 18-19.—Stombaugh guy anchors, Kearney cable clamps, Lima jack boxes and plugs, O. K. sleet cutters, hold-fast lamp guards, Hargis cable-splicing joints. Represented by Claude L. Matthews and James R. Kearney.

McGraw Publishing Company, New York—Building 1, Section A, Space 1.—Technical books and bound volumes of its various publications, Street Railway Journal, Electrical World, and Engineering Record. Represented by James H. McGraw, J. M. Wakeman, H. W. Blake, C. B. Fairchild, Jr., Cail Gough, George S. Davis, H. B. Abbott, C. A. Babtiste, Frank Meyers, W. K. Beard, C. B. Walter, Jr., and C. J. Doyle.

McGuire-Cummings Manufacturing Company, Chicago—Machinery Hall.—One Romunder single-truck semi-convertible car, a McGuire snow sweeper, solid steel Columbian truck, one No. 39-A, short wheel-base truck, one No. 10-A-M. C. B.-type truck. Represented by John J. Cummings, W. J. Cooke and F. J. Ryan.

Miller Anchor Company, Norwalk, O.—Building 1, Section C, Space 20.—Miller anchors, augers and hollow stem tamping bars. Represented by G. H. Miller and F. B. Miller.

National Brake Company, Buffalo, N. Y.—Building 2, Section D, Space 16.—Peacock brakes in all different sizes and styles. Represented by G. S. Ackley, W. D. Brewster, F. D. Miller, W. W. Miller, J. A. Edwards and E. C. Rutherford.

National Brake & Electric Company, Milwaukee, Wis.—Building 3, Section C, Space 1-2-3.—Complete straight air-brake equipment, complete straight air-brake equipment with emergency feature, one new type air compressor, sectional air compressor, sectional slide valve, sectional emergency valve, supply parts for air-brake equipments. Represented by S. I. Wailes, J. T. Cunningham, J. E. Perry, W. H. Goble, W. M. Bisel, W. H. Beattys, Jr., W. R. Crawford, Bert Aikman, G. S. Hastings, R. P. Tell.

National Car Wheel Company, Pittsburg, Pa.—Building 2, Section D, Space 15—Steel-tired wheels with cast-iron centers and cast-iron wheels for electric railway service. Represented by E. H. Chapin, J. H. Yardley, J. D. Cunningham and J. F. Weisbrod.

National Lock Washer Company, Newark, N. J.—Building 1, Section B, Space 29.—Car window models showing operation of curtains equipped with National cam curtain fixture and National balance curtain fixture, with protected grooves, National sash locks, National sash balances and samples of National lock washers, plain nut locks and other patterns. Represented by F. B. Archibald, John B. Seymour, Daniel Hoyt.

Newman Clock Company, Chicago—Building 6, Section A, Space 1.—Night watchman's clocks, employes time recorders, electric signaling clocks and other new time recording devices. Represented by A. A. Newman and C. E. Renshaw.

New York Switch & Crossing Company, Hoboken, N. J.—Building 6, Section A, Space 15-16.—Special track work. Represented by H. R. Sherman, Ernst Armerding and W. C. Wood.

Nernst Lamp Company—See Westinghouse.

Niles Car & Manufacturing Company, Niles, O.—Machinery Hall.—Two 67-foot cars for Columbus Delaware & Marion Railway, one 53-foot car for Aurora, Elgin & Chicago Railway. Represented by J. A. Hanna, F. A. Richards, F. C. Robbins, A. W. Schall.

Novelty Incandescent Lamp Company, Emporium and St. Marys, Pa.—Building 6, Section B, Space 17.—Elk new incandescent lamps, Novelty renewed incandescent lamps. Represented by R. K. Mickey and A. J. Jackson.

Nuttall Company, R. D., Pittsburg, Pa.—Building 1, Section A, Space 10-11.—Gears, pinions and trolleys for electric railway and industrial haulage service. Represented by F. A. Estep, C. N. Wood, Geo. Provost, J P. Provost, T. M. Cluley, R. M. Kerschner, J. S. Monroe, Max Berg and J. W. Porter.

Ohio Brass Company, Mansfield, O.—Building 1, Section B, Space 23-28.—Nichols-Lintern sanders, in operation on Christensen, Westinghouse and General Electric types of engineer's valves; Tomlinson car couplers; Aikman presure annunciators; Armstrong journal oilers, headlights, hose bridges, bell metal bearings, complete single-phase brackets, standard pole brackets, overhead material and all-wire rail bonds installed on rails and Lintern's electric marker and classification system. Represented by C. K. King, A. L. Wilkinson, A. B. Edes, A. L. Price, J. S. Hamlin, P. A. Hinds, E. F. Wickwire, J. E. Slimp, H. G. McDuffie, C. H. Tomlinson, N. M. Garland, S. H. Mattson, R. M. Campbell, F. H. Jameson, G. W. Cooper, A. L. Havens, G. A. Mead, W. H. Williams, F. S. Denneen, W C. Starkey and C. E. Young.

Ohmer Fare Register Company, Dayton, O.—Building 3, Section B, Space 12-13-14.—Various types of recording registers and operating devices and the Ohmergraph. Represented by John F. Ohmer, J. H. Stedman, E. B. Grimes, W. J. Kuhns, W. E. Hinmon, C. V. Funk, Chas. W. Ketterman, Frank G. Colby and H. Tyler.

Oleson-Williams Company, Toledo, Ohio—Building 6, Section C, Space 19.—Lightning arresters for transmission lines. Represented by Albert Oleson, W. A. Williams and Charles C. Williams.

Pantasote Leather Company, New York and Chicago—Building 1, Section B, Space 17.—Pantasote upholstery and car-curtain materials. Represented by J. M. High and D. E. Bonner.

Peerless Rubber Manufacturing Company, New York—Building 2, Section C, Space 14.—Perfected air-brake, steam and pneumatic tool hose, Rainbow sheet packing, Peerless Piston and valve-rod packing, Eclipse gaskets, trolley dodgers, rubber step mats, matting. Represented by G. S. Taylor and C. S. Prosser.

Pennsylvania Steel Company, Steelton, Pa., and Maryland Steel Company, Sparrows Point, Md.—Building 2, Section F, Space 1-7.—Tee and girder rails, special track work, tongue switches, mates, frogs, split switches, switch stands, crossings. Represented by H. F. Martin, Chas. S. Clark, John C. Jay, Jr., Richard Peters, R. C. Hoffman & Company, W. C. Cuntz, R. E. Belknap, J. G. Miller and H. B. Green.

Perry Side Bearing Company, Chicago—Building 6, Section C, Space 5.—Roller side bearings for steam and interurban cars. Represented by H. M. Perry.

Peter Smith Heater Company, Detroit, Mich.—Building 4, Section B, Space 11.—Hot-water heaters for electric cars. Represented by Peter Smith, Elmer J. Smith and Daniel W. Smith.

Phillip Carey Manufacturing Company, Cincinnati, O.—Building 6, Section B, Space 16.—Carey's magnesia flexible cement roofing and all kinds of asbestos materials. Represented by James H. Cooper, John O. Davies and Miss Harriet Wood.

Pittsburg Insulating Company, Pittsburg, Pa.—Building 1, Section A, Space 12.—Insulating cloths and papers. Represented by Phillip F. Norvell and Clifton F. Schmidt, Jr.

Pittsburg Steel Company, Pittsburg, Pa.—Building 6, Section A, Space 5. Electrically welded wire fence. Represented by E. Steytler and E. D. Findlay.

Pontius, W. H., Columbus, Ohio—Building 6, Section C, Space 7.—Safety shields for hand rails on cars. Represented by John M. Beckett.

Power Specialty Company, New York—Building 6, Section A, Space 9.—Foster Superheaters, Duval metallic packing, corrugated bronze gaskets. Represented by Alexander Bradley, Robert H. Wyld and S. H. Kay.

Pressed Steel Car Company, Pittsburg, Pa.—Building 1.—Electric steel passenger car. Represented by W. H. Wilkinson and P. M. Kling.

Quincy, Manchester, Sargent Company, Chicago, and Wallace Supply Company, Chicago—Building 4, Section B, Space 12-13.—Q. & C. Stanwood steps. Represented by Wesley

Rail Joint Company, New York—Building 2, Section C, Space

10-13. Standard T-rail joints of the continuous, Weber and Wolhaupter types, girder joints of the continuous and Weber types, insulated joints of the Weber and continuous types, compromise joints of the continuous type and continuous joints showing their use with the various types of bonds. Represented by B. M. Barr, E. A. Condit, Jr., D. J. Evans, G. M. Hager and W. T. Smettum.

Ramapo Iron Works, Hilburn, N. Y., and Niagara Falls, N. Y. Building 2, Section C, Space 5-6.—Automatic return switch stands, split switches with patented solid-rolled steel riser plates, general track equipment. Represented by Arthur Gemunder and James B. Strong.

Recording Fare Register Company, New Haven, Conn.—Building 1, Section B, Space 8.—Recording fare registers of various types as well as simple fare registers, register rod and cord fittings, trolley wheels, trolley catchers, punches, conductors badges and buttons and general line of railway supplies. Represented by M. DeForest Yates, F. B. Kennedy and Charles N. Yates.

Ridlon Company, Frank, Boston, Mass.—Building 3, Section B, Space 27.—Armature coil taping machine, commutator stones, trolley wheels, Ridlon trolley catchers and retrievers Kilbourn sanding devices, Ridlon & Weld babbitting devices, wire connectors, brass cleats and cable tags, car and register fittings, rail braces. Represented by Henry F. Kellogg.

Roebling's Sons Company, John A., Trenton, N. J.—Building 4, Section A, Space 18-19-20.—Practical exhibition of application of rail bonds, car cables, electric wires and cables, armature and field coils. Represented by H. L. Shippy, A. M. Whaley, G. R. Mitchell, W. W. Affleck, J. W. Brooks, A. B. Conover, Mr. Swartz, Mr. Henry and W. P. Bowman.

Ryerson & Son, Joseph T., Chicago, New York, Pittsburg—Building 3, Section B Space 20.—Working model of Continental boiler with Morrison corrugated furnaces, Ryerson portable automatic key-seating machine, Simplex car and track jacks. Represented by E. T. Hendee and F. B. Slocum.

St. Louis Car Wheel Company, St. Louis, Mo.—Building 2, Section C, Space 2.—Chilled cast-iron street-car wheels (loose) for both local and interurban service, chilled cast-iron street-car wheels mounted on axles for interurban service. Represented by John W. Nute, W. W. Talman and F. O. Grayson.

Security Register and Manufacturing Company, Building 4, Section B, Space 6.—Fare register with clock-faced numerals, double and single recording. Represented by Giles S. Allison and Daniel J. Fitch.

Sherwin-Williams Company, Cleveland, Chicago, Montreal, Newark, London—Building 4, Section A, Space 31-32-33-34.—High-potential testing machines showing practice tests of insulating varnishes, exhibit of panels showing standard colors used by leading railways, car-side exhibit showing the various coats as applied in Sherwin-Williams system of car painting, varnish exhibit, handcraft stain exhibit, pole paint exhibit, rattan seat exhibit. Represented by G. A. Jacobs, H. E. Billau and E. M. Williams.

Sjoberg & Company, J. P., New York—Building 3, Section B, Space 7. Patent car vestibules and sash springs. Represented by J. P. Sjoberg.

Speer Carbon Company, St. Marys, Pa.—Building 1, Section B, Space 14.—Generator and motor carbon brushes and carbon specialties. Represented by J. S. Speer and G. P. Fryling.

Standard Brake Shoe Company, Aurora, Ill.—Building 2, Section D, Space 7.—Steel-back brakeshoes, composition-inserted shoes, coil-inserted shoes, Congdon shoes, plain shoes of special brakeshoe mixture. Represented by C. P. Wright, F. C. Peck and F. P. Collier.

Standard Motor Truck Company, Pittsburg, Pa.—Building 2, Section D, Space 11-12-13-14.—Standard C-35 single truck, Standard O-50 double truck, Standard C-60A. double truck. Represented by A. W. Field and W. G. Price.

Standard Paint Company, The, New York.—Building 4, Section B, Space 18-19.—P. & B. tape, electrical compound and insulating varnishes, Ruberoid roofing. Represented by H. W. Benedict, John H. Thomas, J. H. Vail, F. P. Barker and H. H. Cowherd.

Standard Steel Works, Philadelphia, Pa.—Building 1, Section A, Space 5-6.—Tires, cast iron spoke wheels, cast iron plate wheels, rolled steel wheels, rolled wheel, section cut out, 33-inch cast iron plate wheel, M. C. B. section, M. C. B, motor axles, etchings illustrating cross sections of tire and rolled wheel, electric truck for Ocean Shore Railway Company. (Baldwin Locomotive Works Exhibit.) Represented by Frank Carpenter, H. W. Sheldon, C. H. Peterson, Oliver Bamford, E. S. Lewis, The Standard Steel Works; J. R. Dickey and Warren Thorpe, The Baldwin Locomotive Works.

Standard Varnish Works, New York. Building 4, Section B, Space 3.—Sections of field and transformer coils impregnated under vacuum with solid insulating compounds; solid compounds, both oil and waterproof, for use in connection with vacuum impregnating apparatus, voltalac and insulating varnishes. Represented by J. C. Dolph, L. Robinson, F. A. Elmquist, W. W. Schler and H. B. Chiccote.

Star Brass Works, Kalamazoo, Mich.—Building 1, Section B, Space 15.—Trolley wheels and trolley harps. Represented by O. P. Johnson.

State Manufacturing Company, Cleveland.—Building 6, Section C, Space 1 2.—"Metla-Cota" a preparation for painting and coating the interior of water tubes and steam boilers. Represented by G. A. Bethel and John McDonald.

Stephenson Car Company, Eliabeth, N. J.—Machinery Hall.—See J. G. Brill Company.

Sterling-Meaker Company, Newark, N. J.—Building 1, Section C, Space 15-16-17.—"The Five Modern Registers," Sterling patent center ringing device, rebuilt registers, Sterling safety brake, Giant brake, Sterling trolley base, Sterling fender, Sterling sandbox, Brostiom detachable handles, Sterling register fittings, conductors' punches, register and trolley cord. Represented by George E. Willis, Jerry M. Hayes and Franklin D. Willis.

Sterling Varnish Company, Pittsburg, Pa.—Building 1, Section A, Space 12.—Insulating compounds. Represented by S. C. Schenck, W. V. Whitfield, C. L. Cool, A. S. King and Chas. A. Barker.

Sutphen, C. H., Columbus.—Building 6, Section A, Space 12—Fire extinguishers used in coaches and chemical engines for power plants. Represented by C. H. Sutphen.

Symington Company, T. H., Baltimore, Md.—Building 2, Section C, Space 4.—Symington journal boxes for standard M. C. B. electric trucks of various designs, special journal boxes for special conditions, Baltimore ball-bearing center and side-bearings for electric service. Represented by E. H. Symington, W. W. Rosser, Carll Tucker, C. J. Symington and Jack F. Symington.

Taylor Electric Truck Company, Troy N. Y.—Building 1, Section B, Spaces 3-7.—Single truck, S. B. swing motion double truck, H. L. B. swing motion double truck, M. C. B. type double truck, M. C. B. triple spring double truck, coil and elliptic springs for electric trucks of all types and makes and new design of steel-tired wheel. Represented by John Taylor, C. H. Dodge, Thomas Thorns and Walter Taylor.

The International Fence & Fireprofing Company, Columbus, O.—Building 6, Section A, Space 6-7.—American Concrete Mixers. Represented by R. N. Cunningham, J. M. Campbell, L. W. Cargill, E. S. Dunham and J. W. McPherson.

The Southern Exchange Company, New York—Building 4, Section A, Space 16-17.—Southern white cedar poles, long leaf yellow pine octagonal and square poles, Georgia long leaf pine crossarms, insulator pins. Represented by E. G. Chamberlin and Walter E. Mitchell.

Trolley Supply Company, Canton, Ohio—Building 4, Section B, Space 20.—Knutson trolley retriever, American catcher, Climax combination arc and incandescent headlight, Climax plain arc headlight, Globe dash headlight. Represented by J. E. McLain, J. Hollis and E. Rhoads.

United States Electric Signal Company, West Newton, Mass.—Building 6, Section C, Space 11.—Automatic block signal for electric railways. Represented by John J. Ruddick.

United States Engineering Company, Philadelphia, Pa.—Building 1, Section B, Space 30.—Nachod automatic signal. Represented by Carl P. Nachod.

United States Metal and Manufacturing Company, New York—Building 1, Section C, Space 9.—Perfect car replacers, Victor car replacers, Columbia lock nuts. Represented by B. A. Hegeman, Jr., Fred Atwater and F. C. Dunham.

Van Dorn Company, W. T., Chicago, Ill.—Building 3, Section B, Space 26.—Automatic car couplings, draft riggings, model of steel box-car. Represented by W. T. Van Dorn and John Sjoquist.

Van Dorn & Dutton Company, Van Dorn Elliott Electric Company, Cleveland, O.—Building 2, Section D, Space

1.—Gears and pinions. Represented by J. N. Elliott, H. L. Schneider and C. I. Cartright.

J. H. Wagenhorst & Company, Youngstown, O.—Building 6, Section B, Space 6.—Machine for making blue prints by electricity. Represented by J. H. Wagenhorst, Donald Parson, E. Blake.

Wallace Supply Company, Chicago and New York—Building 4, Section B, Space 12-13.—Wallace double-door fixtures, Stanwood steel steps, steel gongs, automatic couplers, draft rigging, bending tools (hand power). Represented by Wesley Meeteer, Carl Merterharsen and Burten R. Stare.

Watson-Stillman Company, New York and Chicago—Building 4, Section C, Space 11-12.—Hydraulic railroad tools. Represented by Edward A. Johnson.

Westinghouse Companies, Pittsburg—Building 3, Section C, Space 4-19.—The apparatus displayed is that made by the Westinghouse Air Brake Company, Westinghouse Traction Brake Company, Westinghouse Automatic Air & Steam Coupler Company, American Brake Company, Westinghouse Electric & Manufacturing Company, Nernst Lamp Company and Cooper-Hewitt Electric Company. The exhibit of the Westinghouse Air Brake Company and Westinghouse Traction Brake companies is composed of air brakes for light and heavy surface traction, also air brakes for elevated, underground and interurban traction. They also exhibit a blowing outfit for commercial purposes. The exhibit of the Westinghouse Automatic Air & Steam Coupler Company consists of a working model of the automatic air and steam coupler. The American Brake Company's exhibit consists of various styles and sizes of brake slack adjusters. The Westinghouse Electric & Manufacturing Company shows in operation a set of Westinghouse electro-pneumatic control, operating two No. 121 motors mounted in their trucks. The set also operates two motors mounted on one shaft and arranged with prony brake, such as is used in factory tests. Display is made of stationary and portable instruments, wattmeters, voltmeters. ammeters, power factor meters, various kinds and sizes of both desk and ceiling fans; different designs of copper arc lamps; A. C. and D. C. railway motors of different horse power; high tension line material; also a number of separate armatures, fields and motor parts. The exhibit is lighted by Nernst lamps and Cooper-Hewitt lamp. Represented by—For the Westinghouse Electric & Manufacturing Company: R. W. Beebe, J. A. Brett, R. S. Brown, L. M. Cargo, Wm. Clegg, W. L. Conwell, C. S. Cook, Thomas Cooper, W. Cooper, H. P. Davis, J. L. Davis, G. B. Dusinberre, W. F. Fowler, Guy H. Gibbs, J. J. Gibson, J. R. Gordon, S. J. Keese, S. M. Kintner, J. C. Kyle, W. M. McFarland, H. C. Marsh, C. F. Medbury, W. E. Parker, D. D. Pendleton, T. S. Perkins, C. S. Powell, C. W. Register, F. F. Rohrer, F. H. Shepard, O. T. Smith, H. C. Stier, N. W. Storer, T. Varney, J. E. Webster, and G. B. Griffin. Westinghouse Air Brake Company: G. W. Baker, W. S. Bartholemew, R. H. Blackall, Robert Burgess, C. P. Cass, H. S. Clark, E. A. Craig, E. H. Dewson, C. R. Ellicott, Jos. R. Ellicott, F. V. Green, A L. Humphrey, S. D. Hutchins, A. Johnson, John F. Miller, F. M. Nellis, C. J. Olmstead, C. W. Townsend and W. V. Turner. Westinghouse Machine Company: John B. Allen, J. H. Wagonhorst, Edwin Yawger and H. D. Watson. Nernst Lamp Company, James L. Anderson. Representing joint interests: J. C. McQuiston and F. S. Smith.

Western Electric Company, Chicago and New York.—Building 4, Section B, Space 21.—General railway material, Electrose Manufacturing Company's line. Represented by Fred R. Babcock, W. L. Stockton, D. C. Guest, E. A. Burrows, F. D. Killion, R. H. Harper, L. T. Milnor, C. A. S. Howlett and H. Walton Heegstra.

Wheel Truing Brake Shoe Company, Detroit, Mich.—Building 1, Section B, Space 16.—Abrasive brakeshoes. Represented by J. M. Griffin and F. F. Griffin.

William Wharton, Jr. & Company, Philadelphia, Pa.—Building 2, Section B, Space 1-7.—Manganese steel special track work of improved types, including switches, mates and frogs of "Easy Renewable" center construction, H. T. switches, both in girder and T-rail solid Manganese steel girder-rail tongue switch, solid manganese steel tongue switches, mates and frogs of T-rail construction, Dunham spring throws and switch locks, Wharton unbroken main-line switch for trolley road; manganese steel funnel castings for bridge guides, manganese steel center steam crossings, manganese steel split switch, ground throws and switch stands as well as models of the Wharton switch for steam roads, U. M. L. derailing switch for street railways; section of a frog of "Easy Renewable" center construction, butt end of an H. T. switch, showing construction of same besides enlarged photographs and black and white prints showing work furnished, worn manganese frog that has been in use in Broad Street Station, Pennsylvania railroad for six years. Represented by Wm. Wharton, jr., L. R. Ashburst, jr., J. C. Robinson, A. S. Partridge, J. B. Robinson, W. H. McDermott, Victor Angerer, R. C. McCloy, James W. Stringfellow, George R. Lyman, W. McLain and T. L. Hanley.

Wilson Company, The, Chicago.—Building I, Section C, Space 3-4.—A daily edition of the Electric Railway Review reporting the proceedings of the conventions. Represented by Hugh M. Wilson, Francis W. Lane, Daniel Royse, William Forsyth, L. E. Gould, John N. Reynolds, J. Boyd, Frank S Dinsmore, Louis Pelletier, William Padget, E. J. Hunt, J. N. Nind Jr., Harold F. Lane, C. R. Mills, H. K. Stroud, J. A. Kucera, F. J. Phelps and C. Smith.

Wilson, Jas. G., Manufacturing Company, New York—Building 6, Section B, Space 7.—Rolling steel doors, rolling wood doors, sliding swing doors. Represented by A. H. Dodge, Percy H. Wilson and Lester G. Wilson.

Yale & Towne Manufacturing Company. New York.—Building 3, Section A, Space 6 and 7.—Electric hoists, chain blocks and trolleys. Represented by H. E. Dickerman and C. W. Beaver.

CONSOLIDATED ELECTRIC HEATERS.

The Consolidated Car Heating Company's new type of cross-seat heaters with junction boxes attached are installed in the Brooklyn Rapid Transit car being exhibited at the convention by the Jewett Car Company. There are 18 double-coil heaters per car of a new type both coils being wound on a spindle having a double groove. The connecting wires are carried in conduit and joined to the heater wires in the junction box. Complete switchboards, as well as heaters are being furnished by the Consolidated Car Heating Company to the Brooklyn Rapid Transit Company for 100 cars like the sample exhibited. The switchboard however is not shown in the exhibition car.

This company's electric heaters are installed in the Boston Elevated steel car which is exhibited by the Pressed Steel Car Company. There are 18 double-coil heaters of the panel type in this car placed back of the steel risers. This is a new type of heater the heater backs being continuous and extending the full length of the car. Small switchboards for controlling the heaters are also furnished. This car is a sample of a lot of 45 steel cars in which "Consolidated" electric heaters are to be used.

"Consolidated" electric heaters may also be seen in the Boston Elevated semi-convertible car which the J. G. Brill Company is exhibiting. There are 20 cross-seat heaters per car, with "Consolidated" standard quick-break knife switches. This car is a sample of a lot of 50 semi-convertible cars for which heating equipments are being furnished by this company.

ROBERT W. HUNT & CO.

The firm of Robert W. Hunt & Co., engineers, bureau of inspection, tests and consultation, maintains offices in Chicago, New York, Pittsburg, San Francisco, Montreal, London, and Buenos Ayres with staffs of inspectors located at various manufacturing plants throughout the United States and Canada, as well as in Europe. During the 18 years the firm has been in business, it has enjoyed an enviable reputation.

The company's staff of mechanical, civil, and electrical engineers, has shown ability in a consulting capacity as the designers of power plants, electric railways, lighting and heating plants, cement and gas plants, and in the investigation and appraisement of mining properties, etc. The corps of inspectors consists of a large force of practical and experienced men, and the company makes a specialty of the inspection of general railroad material, such as rails, bridges, locomotives, cars, as well as all accessories, such as splice bars, bolts, spikes, car wheels, axles, etc. Besides general railroad material it inspects almost every class of material, including cement, pipe, boilers, etc., and is in a position to inspect the material of small purchasers as well as large. The growth of the business in the last five years is an indication of a definite recognition of the value of competent inspection.

Electric Railway Review
DAILY EDITION

PUBLISHED BY THE WILSON COMPANY
at Columbus, O., in honor of the Annual Conventions of the American Street and Interurban Railway
Association and of its allied associations of Accountants, Engineers, Claim Agents and Manufacturers

COLUMBUS: 83 North Third Street CHICAGO: 1660 Monadnock Block NEW YORK: 150 Nassau Street PITTSBURG: 510 Frick Building
Subscription Price, $1; Foreign, $3; Single Numbers, 10 cents. Application made for entry at Columbus O., as Second-class matter

VOL. XVI COLUMBUS, O., OCTOBER 16, 1906 No. 10b

Postage for This Issue Four Cents per Copy.

Those who desire to send copies of the daily editions of the Electric Railway Review to their friends should note that the postage required for this issue is four cents per copy when mailed by others than the publishers. At the Review headquarters at the Fair Grounds there will be an ample supply of wrappers for the daily edition which will be furnished to those who have need for them. Yesterday a good many copies of the Daily Review were mailed with insufficient postage and are held at the Columbus postoffice. Orders will be received at the Review headquarters in case it is desired to have the daily edition sent regularly to non-subscribers. The daily edition is mailed daily to subscribers of the Electric Railway Review.

New Work for the Engineers.

In his annual address before the Engineering association, President Adams made a number of specific recommendations which are deserving of careful consideration. One was for the co-operation of the Engineering association with the American's committee on "Insurance," with a view to securing an early presentation of the engineering features involved in the construction of railway buildings of greater fire-resisting properties, and the installation of fire fighting devices. A second recommendation was that the work of "Standardization" next to be taken up by the committee includes such parts of the electrical equipment as commutators, brushes and holders, gears, pinions and axles; the idea is that the association endeavor to enlist the interest of the electrical manufacturers in standardizing parts for motors of the same capacity. In conclusion Mr. Adams discussed the responsibility and services of the engineer in having to design and maintain the physical property in good condition so that breakdowns and other aggravating interruptions to service may be as infrequent as possible. It is considered that excellence of service, for which the engineer is, in the last analysis, responsible will be found a most important factor in the settlement of the burning questions of the relations of the street railways to the public which are now so much discussed.

Some Work of the Claim Agents'.

President Rhoades of the Claim Agents' association, in the course of his address of the opening session yesterday, took occasion to congratulate the association upon the harmonious relations which obtained between it and the parent body, and outlined the field in which the Claim Agents' had been most active during the past year and the direction in which the greatest opportunity for the future was offered. The increase in the extent to which fraudulent accident claims are imposed upon street railways has been growing and methods of combatting the evil are suggested for early consideration with a view to making recommendations to the American association. A great deal of the work of the secretary last year has been in connection with exposing frauds of this nature and warning member companies, and we venture that the railways, because of these efforts have saved many times the total cost of maintaining this association. One of the interesting features of the Claim Agents' convention is the exhibit of blanks and forms pertaining to this department of the railways, which Secretary Davis, at the suggestion of Mr. Rhoades, has collected for permanent file in his office. The secretary in securing these had the hearty co-operation of all the 201 member companies and the collection is practically complete.

Engineers and the Managers.

In a brief extemporaneous address at the opening meeting of the Engineering association, Mr. John I. Beggs emphasized the fact that no matter how capable the financiers and managers of railway properties may be they are utterly helpless unless they have able and competent men for the heads of their departments, and that the American association can accomplish the best results by encouraging the efforts of the several departmental associations. The departmental associations must be relied upon to do a great deal of the work and the relations of the American association to them should be that of a parent towards his industrious and successful children. In conclusion Mr. Biggs said that managers who are not engineers would nevertheless do well to attend the meetings of the Engineering association and pick up practical points wherewith to arm the the arrows of inquiry directed towards their subordinates in the engineering departments. Mr. Beggs' prominence and influence in the American association lend especial weight to this graceful tribute to the work and methods of the Engineering association.

Pay-as-You Enter Car.

Operating officials of large city systems will doubtless be greatly interested in the "pay-as-you-enter" car of the Montreal Street Railway Company, which may be seen among the cars in Machinery Hall. Those who attended the meeting of the Street Railway Association of the State of New York at Albany last month will remember that the features of this type of car were discussed by Mr. Duncan McDonald, manager of the Montreal company, (Electric Railway Review, October, p. 608.) This car, which was built by the railway company and which is in the form used on three of its lines, is chiefly remarkable in the design of the rear platform which is 9 feet long open on one side and closed on the other. Two doors, one on each side, open from the body of the car on to the platform, that on the open side being for exit only and the other one for entrance. A brass railing separates the entering passengers and those leaving the car and encloses a place for the conductor to stand between the two doors. No one may enter the car without passing the conductor and depositing a fare in the portable fare-box, and the conductor is thus relieved of carrying in his mind for ten hours a day a mental diagram of the passengers in the car and of the effort to remember which passengers have paid their fares. He is also free to give his attention to passengers entering or leaving the car and see that the car is not started too soon. The forward half of the car is provided with cross seats and the rear half with longitudinal seats, so that there is in this end of the car an unusually wide aisle, of sufficient capacity to prevent collisions between persons entering and those leaving. This arrangement is especially effective, as those who occupy the front end of the car are expected to leave by the front platform. Mr. McDonald said that this system had worked very well so far and that the increase of revenue on this form of car, compared with others running on the same line on the same day, was anywhere from 8 to 15 per cent. The advantages of this system are manifest. It is stated that in Montreal it has been an easy matter to accustom the people to enter by the proper door, and in fact the conductor is in a position easily to prevent anyone from trying to enter by the wrong door. Many accidents can be prevented by having the conductor always on the rear platform where he can watch the people as they get on and off. Moreover, in addition to making the conductor's work much lighter and increasing the company earnings there are many moral advantages.

Peculiar Technical Jargon.

Philologists constantly are reminding us of the changes which our language is undergoing both in the meaning of words and in their spelling. Every department of industry has what the purists designate as a "peculiar jargon" of its own, and these trade and technical terms are eventually accepted as good usage, and are responsible for many of the changes in the language. The electric railway is responsible for its full share of new terms and of new meanings for old terms, some of which are far from being happily chosen. The words "electrify" and "electrification" have for several years been used to some extent for verb and noun to replace the phrase of "to equip for electrical operation." The old meaning of electrify was "to charge with electricity" (generally used as referring to static electricity only), with a figurative application in the sense of sharply stimulating or shocking. The extension of the meaning as more recently applied to the equipment of railroads may be technically accurate as the positive and negative conductors through which current passes to and from car motors, may be said to be "filled" or "charged" with electricity. The use of these terms has not been accepted gladly in all quarters, but inasmuch as the terms "electrify" and "electrification" have been adopted by the steam railroad companies which are the pioneers in converting portions of their line for operation by electricity, protest against the use of these words in the sense defined probably will be in vain and the usage may as well be gracefully accepted. "Trolleyize" is a verb recently coined and would be preferable to "electrify," except for the fact that trolley when used alone is understood to exclude the third rail and conductors placed underground, which methods of conducting current to the car are included in electrify. "Signal" used as a verb, in the sense of "to equip with signals," is believed gradually to be receiving an undeserved recognition. "Sign" as a verb, in the sense of "to equip with signs," has been heard colloquially, but seldom, if ever, has defaced a printed page. In the matter of innovations of this character the sympathies of the Electric Railway Review are with those British critics of the President who designate as an anarchist any one who troubles other than his immediate circle of friends with spelling reform and the like. The technical journal should be conservative in such matters, although eventually general usage must govern.

Maintenance and Inspection.

There is a pressing demand for information relating to the cost of maintaining electric cars, and it is especially desired by many engineers who are making estimates on the comparative cost of operating steam and electric railroads. The most complete and satisfactory figures are those obtained from the electric elevated lines in New York City and Boston, but this is a service which is not exactly comparable with interurban business which more nearly resembles steam railway operation. The report on the Maintenance of Electric Cars presented at this meeting is based largely on the practice and equipment of the Interborough Rapid Transit Company, of New York. While the report does not give actual figures showing the cost of maintaining that equipment, it describes the methods by which the cost of inspection has been largely reduced. While steel car construction has been adopted for the subway as a measure of safety and a protection against fire risks, it has important merits in the greated strength which affords protection in collisions. The endurance of steel cars on steam roads has been shown to be so much greater than wood that the cost of maintenance has been largely reduced and the same thing can be expected from the steel cars built for electric lines. The cars on the Interborough have the wiring and auxiliary apparatus installed from working drawings which have special reference to permanence and durability. This is an advantage which is worth more than the cost in the way of carefully detailed drawings, but which is often left to the haphazard work of a contractor. Much has been accomplished on the Interborough in reducing the cost of inspection by a better management of the men. Personal responsibility is emphasized and the merit system is so well carried on that a more reliable service is obtained at a reduced cost. The foremen are required to be competent and industrious and such men are rewarded by increased salaries and the poorer men are dismissed. Car inspection often becomes a matter of routine and is performed frequently in an effort to insure safety, because there is lacking an intelligent idea of what is necessary for safety. On the Interborough a change was made from a day to a mileage basis, and the mileage between inspections was doubled without impairing the service. The volume of inspection was thus materially reduced and the expenses lessened. It was found that the mileage between general repairs on this system varied from 35,000 to 90,000, and it was decided to have cars come in regularly for repairs after making a service of 65,000 miles. The service between the oilings of the motor axle bearings was also extended from 3,000 to 10,000 miles.

THE SELECTION OF BOILER FEED PUMPS.

The choice of feed pumps for a power plant is a matter of much greater consequence than is often realized. Auxiliary equipment of this character is frequently selected in the most offhand manner, the lowest price received in the bids submitted being the decisive factor. In reality it is quite as important to give careful consideration to the small apparatus in a plant as to devote a long period to the balancing of advantages in large equipment. The reason is plainly that in the modern power house, each piece of machinery constitutes a link in the chain of energy producing or transferring mechanisms and the failure of a single link invites serious trouble.

The general styles of steam pumps for feeding boilers may be classified as those with outside packed plungers, and those with inside packed plungers, practically all the standard outfits commonly used today being of the horizontal type. In considering the choice of feed pumps for a recent plant the advantages of the outside packed plunger were found to be that they are built for high pressures; that all leakage at the water plungers is visible and can be readily attended to; and that all dirt and grit settled in the water chamber away from the moving parts. These features counted for increased reliability of operation in heavy work and added facility of repairs, but in the plant in question the disadvantages of greater space occupied, increased friction, and higher first cost led to the selection of inside packed equipment. Excessively higher pressure were not required in feeding the boilers in the case cited and the water was of admirable quality and free from dirt and grit.

To determine the number and size of feed pumps for a given installation is not always easy, unless the boiler capacity and service requirements upon the boiler units are definitely settled. In the case in point, it was expected that the maximum boiler capacity that would ever be installed would be about 2,500 horsepower, the present layout being 900 horsepower with the probability of an additional 300 horsepower at no distant date. Hence it was deemed desirable to elect pumps of such capacity that they would serve the purpose for the present, even at times of low load, and also be suitable for the future plant. The problem then resolved itself into the installation of two pumps, each capable of supplying water for 1,200 boiler horsepower with ease, and one capable of feeding a 300-horsepower boiler. Such a combination gives ample capacity with one pump, and permits economical operation with the small pump at times of light load. Low piston speed is desirable to reduce the risk of breakdowns and delays due to protracted stoppages. This equipment enables a 2,500-horsepower boiler plant to be cared for without a spare pump, in case it should be considered wise later to purchase a spare unit, the plan included one of the larger size.

Pump size may be readily determined by assuming about 4 gallons water required per boiler horsepower per hour. The catalogues of the manufacturing companies may then be consulted for a size which will deliver the required quantity without too great a piston speed, and the bids compared. In the plant mentioned two duplex pumps 9x5¼x10 inches and one 5¼x3¼x5 inches, were selected as suitable; the larger size delivers .93 gallons per stroke of each piston, and the smaller size .2 gallons per piston stroke, so that the 80 gallons per minute required for 1,200 boiler horsepower means about 45 strokes per minute, or a piston speed of 37 feet per minute in the two larger pumps, and the 20 gallons per minute required by 300 boiler horsepower demanded 50 strokes per minute or about 21 feet piston speed for the small unit. Both of these speeds are perfectly safe for continuous operation. It was finally decided to install as the smaller unit a 6x4x6-inch pump for the service of feeding one 300-horsepower boiler under heavy overloads, the difference in cost being very slight. In harmony with the best practice the pumps in the plant considered were installed in a separate room apart from the boilers and engines, to enable the equipment to be treated as a separate operating unit in the regular cause of the plant's running. Some such reasoning as the foregoing, jointed to examinations of bids, guarantees, floor space occupied and experience with different makes, renders the selection of feed pumps a more scientific proceeding than is followed in far too many instances at the present time.

Mr. Robert W. Wallis, second vice-president of the Accountants' association, arrived yesterday in time for the meeting this morning. Mr. Wallis is treasurer of the Fitchburg & Leominster Street Railway Company.

Mr. W. Boardman Reed, who was until recently engineer of maintenance of way and bridges of the New York City Railway Company, but is now engaged in private practice, arrived from New York on Monday to attend the conventions.

One of the first events on the entertainment programme was a general informal reunion at the Southern hotel last evening. A large number of the visiting railway and supply men took advantage of the opportunity to meet old friends again and form new acquaintances and the scene was a lively one throughout the evening. A considerable number of the ladies were present in the balconies overlooking the main lobby and were the centers for many cheerful groups. President Ely and Secretary Swenson of the American association were on hand and very much in evidence, as were also President Adams and Vice-President Simmons of the Engineering association, and Secretary Ben Harmon of the conventions committee of the Columbus Board of Trade was always the center of a genial gathering. An orchestra in the balcony furnished lively and popular music that added greatly to the pleasure of the occasion and when interrupted later in the evening by the entrance of two colored musicians with a guitar and mandolin, who played selections foreign to their repertory and who were immediately and enthusiastically joined vocally by the younger delegates, they gracefully yielded.

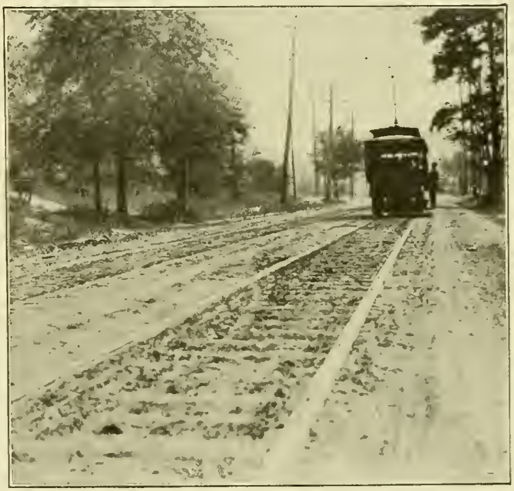
BALLAST.

By C. H. Clark, Engineer Maintenance of Way, The Cleveland Electric Railway Company.

In speaking of ballast for street railway work the writer will not confine himself to the material used directly under the ties. We must be governed in the use of ballast by the material that the ballast is to rest upon. In Cleveland, O., the greater portion of the underlying foundation is composed of sand, some of which contains a large percentage of loam. We have some streets in which clay soil predominates.

In the sandy streets, before laying our tracks, we puddle the trench. This is done by building earth dams and flooding the trench with city water. As a general rule this will cause a settlement of the original earth of from 3 to 6 inches. Large crevices are sometimes formed over sewers when the Sewer Department has not taken all the precautions to guard against such settlement. In clay and shale, where sewers have been constructed and the tracks must be laid immediately, it is our practice to excavate the clay or shale to a greater depth than will be needed for ballast, and partly fill with sand and then cause the sand to be settled into the voids by the liberal use of water.

Having the sub-foundation thoroughly settled, we are prepared to say whether there must be a drain laid. In clay soil we have found that a drain should be laid in the space between the tracks. This has been brought forcibly to our attention by the fact that a section of track in one of our streets, which was laid in 1902 on 5 inches of broken stone, settled in some places to a depth of 6 inches. This was caused by the water from the street getting under the tracks and allowing the broken stone to settle into the clay. We have since repaired about one mile of this track, and placed a drain between the tracks and conveyed the water which found its way under the ties to the nearest catch-basin.

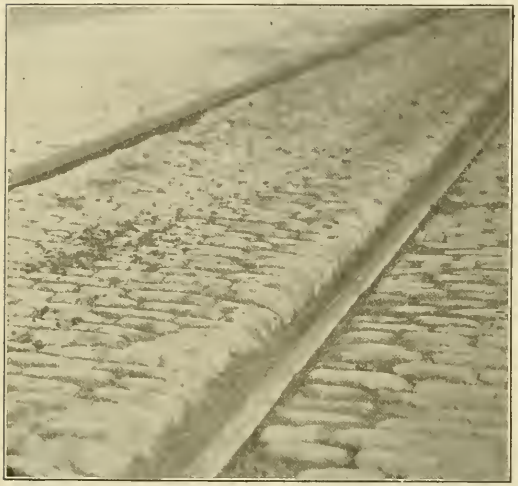


Ballast—Figure 1—Track Laid with No Ballast but Cinders.

In sandy streets the settlement of the sand by water is far superior to any other method thus far tried. Rolling with a heavy iron roller will not settle sand as it should be. I do not recommend draining sandy foundations unless they contain water.

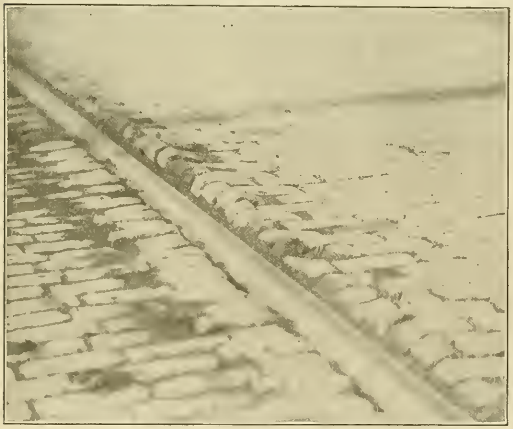
The simplest way of tamping tracks is to use the material thrown out of the trench. This can only be an economical method when building suburban tracks, and the tracks are tamped on sub-grade before running the ballast trains over it. This will prevent springing of rails. This method is also used on roads which are built to sell without having to operate them. We have a large amount of track which was built when horse-cars were used, or light motors. But with the heavy cars, which must sooner or later run over your tracks, a good foundation must be provided.

Tamping bars are used on gravel and sand, and tamping picks on broken stone. Tamping bars are also used on concrete under the ties and under the rail.



Ballast—Figure 2—Track Laid with No Ballast but Common Soil.

On a number of our streets the soil is sandy and the tracks have been down about twelve years. The rail is the Lorain Steel Company's 90-pound, No. 206, laid on chestnut ties and the joints are cast-welded. The ties were tamped with the material taken out. This track has been a constant expense for the last four years, lowering high paving stones caused by the working of the rails and ties on the foundation. I cannot state just when this track commenced to work. I will refer you to the photograph, which shows the high stones.



Ballast—Figure 3—Track Laid in Common Soil, Brick Pavement.

Another type of construction used by the Cleveland City Railway Company prior to 1903, was to lay 4 inches of concrete on the bed before laying the ties. Then cover this with 1 inch of sand and tamp the ties with the sand. The space between the ties was then filled with concrete and sand laid on top of this for the paving bed. This method worked very well and gave good results, but I do not consider it as satisfactory as the concrete under and between the ties after the rail is laid. The concrete, when laid first, must not be used until thoroughly set. Of course the rigidity of the track when using concrete is greater than when using a sand construction.

Ballast—Figure 4—Track With Six-Inch Rail on Concrete and with Chairs.

A standard construction in Syracuse, N. Y., in 1895, was to use coarse gravel for the foundation. This was laid for a depth of 6 inches and thoroughly rolled. The track was then laid and tamped with fine gravel and this thoroughly rammed between the ties to prevent settlement of the paving.

Steel ties have been used with great success by the Clevland Electric Railway Company on some of the heaviest lines. The Lorain Steel Company ties were laid every 10 feet, alternating with a wooden tie spaced the same distance. Eight inches of concrete was laid under the steel ties, and 4 inches under the wooden ties and a beam 10 inches deep under and along the rails. To date we have had no trouble with this track, some of which has been down three years. I examined some track of the same

Ballast—Figure 5—Track with Six-Inch Rail on Concrete and with Chairs and Brick Pavement.

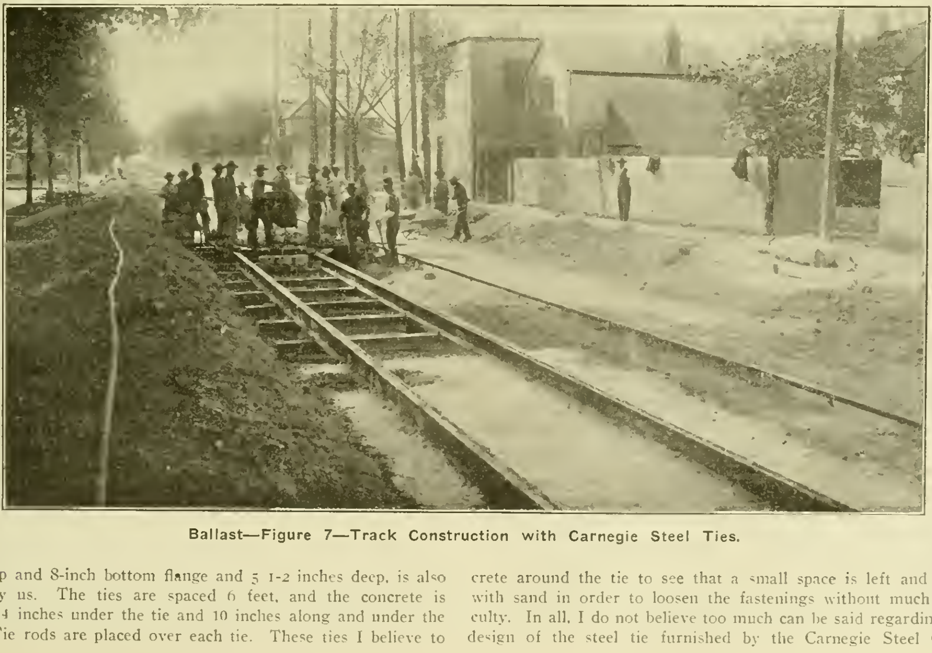
construction in Detroit, Mich., in 1903, and found the ties were not stiff enough to withstand the outward pressure of the rails. I attribute this to the concrete. I found that the concrete was not of sufficient quality to withstand the stress placed upon it, thus allowing the ties to buckle.

Ballast—Figure 6—Track Laid Over a Sewer.

Ballast—Figure 8—Standard Track in Cleveland, O.

The Seitz tie, manufactured by Seitz Bros., Tiffin, O., is a very good steel tie, made on the plan of an inverted channel. The ties are very strong. They have been in use there about two years. The ballast is laid the same as with the Lorain Steel Company tie.

The Carnegie steel tie, which is an I-beam with a 4 1-2-inch top and 8-inch bottom flange and 5 1-2 inches deep, is also used by us. The ties are spaced 6 feet, and the concrete is tamped 4 inches under the tie and 10 inches along and under the rail. Tie rods are placed over each tie. These ties I believe to be the strongest and most durable steel tie yet placed on the market.



Ballast—Figure 7—Track Construction with Carnegie Steel Ties.

All objections to steel ties buckling and deteriorating seem to have been removed by the present shape of the Carnegie steel tie. Great care must be taken in cross-bending when using steel ties, or in fact any tie. The action of the current in passing from one rail to the other through the tie rods and steel ties causes more or less eating away of the ties and rail where they are in contact. As to relaying of rails when worn out without disturbing the road bed, I do not believe much can be said: The bolts cannot be used again and it is well when placing the concrete around the tie to see that a small space is left and filled with sand in order to loosen the fastenings without much difficulty. In all, I do not believe too much can be said regarding the design of the steel tie furnished by the Carnegie Steel Company. Regarding the cost of same installed, I will submit a table showing the actual cost of using them as compared with white oak ties:

CARNEGIE STEEL TIES.

Ties spaced 10 feet apart:

10 ties per hundred feet, at $2.50 each	$ 25 00
164 yards concrete, at $5 per yard	82 00
Total cost, per 100 feet	$107 00
Ties spaced 6 feet apart: Total cost	$126 66
Ties spaced 5 feet apart: Total cost	136 45
Ties spaced 4 feet apart: Total cost	151 35
Ties spaced 3 feet apart: Total cost	175 83

WOODEN TIES.

Cost of ballast and ties for different types of construction, allowing 40 cents per foot for oak ties, spaced two feet apart.

No. 1—Tamping with material taken out; no extra excavation:

Tamping	$ 0 04
Tie	40
Total, per foot	$ 0 44

No. 2—Seven inches broken stone under ties and concrete between the ties:

.18 yard crushed stone, at $1.50 per yard	$ 0 27
.1 yard concrete, at $5 per yard	50
Tamping crushed stone	8
Extra excavation and removing the same	7
Tie	40
Total, per foot	$ 1 32

No. 3—Seven inches broken stone under ties and broken stone between the ties:

.28 yard of stone, at $1.50 per yard	$ 0 42
Tamping the same	8
Extra excavation and removing the same	8
Tie	40
Total, per foot	$ 0 98

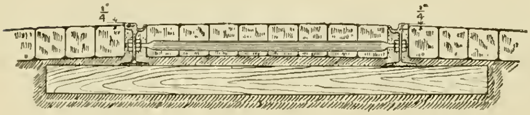
No. 4—All concrete; 5 inches below and filled to the top of the tie:

.218 yard of concrete, at $5 per yard	$ 1 09
Extra excavation and removing the same	7
Tie	40
Total, per foot	$ 1 56

No. 5—Four inches concrete; 1 inch sand under tie and concrete between the ties:

.208 yard concrete, at $5 per yard	$ 1 04
Extra excavation and removing same	7
Tie	40
Total, per foot	$ 1 51

It will readily be seen from this that the steel tie laid in concrete is cheaper than the white oak tie laid in concrete or broken stone. This on the assumption that white oak ties cost 80 cents apiece. This price, of course, varies in different localities, and the difference in price can readily be applied for comparison. The life of the steel tie can readily be placed at 20 years, and the white oak at about 12 years.



ORIGINAL SOIL
Figure 9.

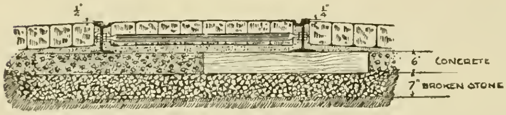


Figure 10.

I have found in repairing old tracks that the concrete which has been laid for four or five years was very poor. It has been my practice not to make any but first-class 1-3-6 concrete. This may cost more than the concrete that would pass city inspection, but it will be found that the best is none too good for your company in the long run.

By using the best of concrete between the ties, the concrete will take the place of the tie in carrying the rail.

The sketches show the different classes of construction on which the estimates were based.

The photographs have been taken with the object in view of showing what effect the different foundations have on the pavements. The foundation supports the rails as well as the pavements.

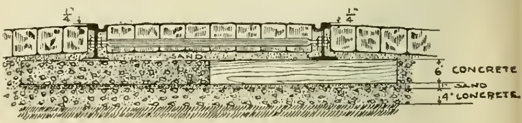


Figure 11.

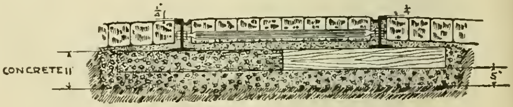
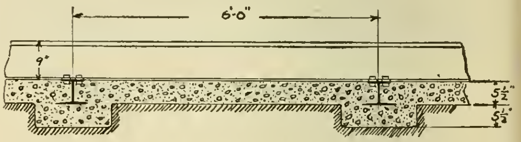
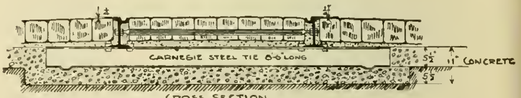


Figure 12.



LONGITUDINAL SECTION
Figure 13.



CROSS SECTION
Figure 14.

In conclusion, I would recommend that drainage pipes be placed in clay soils, in all wet sandy soils, and that when the traffic can be kept off the track, that a solid foundation of concrete, made in the proportion of at least 1-3-6 with best Portland cement. Bring your concrete up to within one inch of the bottom of your pavement. The first cost of your foundation may seem large, but the cost of the annual maintenance thereafter will be greatly reduced.

The brilliancy of the cars forming the exhibit of the J. G. Brill Company (no charge for the pun,) calls to mind an account given yesterday of the early days of the American Street Railway Association by a man who at that time represented a paint and varnish manufacturer. He said he was forced to give up attending one of the conventions because he felt compelled to answer truthfully the question of his employer whether there was any company represented in the association that used over a gallon of varnish in a year. But probably the features of the Brill exhibit that will be studied with the greatest interest are the "Pay as you enter cars," built for the Montreal Street Railway Company where this plan of collecting fares has been in use for some time with results understood to be highly satisfactory. Several types of convertible and semi-convertible and combination baggage, smoker and passenger cars, with samples of the types of trucks that are becoming so well-known on both American and foreign street and interurban railways, make up the rest of an exhibit that can be studied with valuable results by all convention attendants.

CONVENTIONALITIES

Mr. H. M. Littell, of New York, an ex-president of the American Street Railway Association, is stopping at the Southern Hotel.

Mr. C. H. Weeks, vice-president of the Buckeye Engine Company, Salem, O., is in attendance at the convention renewing acquaintances.

The Albert & J. M. Anderson Manufacturing Company, Boston, Mass., is distributing souvenir match boxes to visitors at the company's exhibit.

Mr. J. H. Wilson, president Mobile Light & Railway Company, Mobile, Ala., arrived at Columbus Sunday and registered at the Southern.

Mr. S. F. Hazelrigg, president Atlantic Coast Electric Railway, Asbury Park, N. J., will arrive at Columbus Tuesday morning and will register at the Northern Hotel.

More than a word should be said in praise of the veritable life-savers who have installed well-filled ice-water coolers in their booths which are a veritable well-spring of joy in a thirsty land.

W. L. Arnold, of Chicago, who is popularly called "Bill," because his front name is Whalen, arrived in Columbus Monday morning to look after the interests of his firm, the Arnold Company.

Arthur S. Partridge, dealer in street railway supplies with headquarters at St. Louis, is at the convention shaking hands with his many friends, and getting acquainted with the new attendants.

Hon. L. C. Laylin, secretary of state of Ohio, will deliver an address of welcome on behalf of the state at the opening session of the American Street & Interurban Railway Association on Wednesday morning.

A few of the railway officials who have found it convenient to come to Columbus during the opening days of the convention will leave for their homes Wednesday and allow other officials to come during the closing sessions.

M. Baxter, master mechanic of the Ohio Railway Company, is scheduled to reach the convention grounds this afternoon. Mr. Baxter was formerly connected with the Westinghouse Electric & Manufacturing Company.

The kind consideration of the readers of the Electric Railway Review is invoked on behalf of the misguided labors of the intelligent compositor who sometimes makes two jokes grow where only one grew before. The second one is on us.

Included in the party on the Boston special which arrived early Monday morning were Hon. E. P. Shaw, ex-treasurer of Massachusetts, his two sons, James F. and E. P., Jr., and Mrs. E. P. Shaw, Jr., representing the Shaw syndicate of electrical railways.

It is interesting to note the large representation that the electric railways operating in the New England and other eastern states have at the convention. The delegates from nearly all of the member companies arrived before the convention was opened up Monday.

D. F. Carver, general superintendent of the Rochester Railway Company, Rochester, N. Y., arrived in Columbus this morning. After spending a day or two at the convention grounds Mr. Carver expects to return to Rochester and give some of the boys at home a chance to run over and look over the exhibits.

Coincident with the change in the location of the manufacturing plant and headquarters of the Lord Electric Company, from Boston to New York, Mr. Edwin M. Hamlin announces that on account of this removal and his reluctance to remove his family from Boston to New York, he has tendered his resignation. In a circular letter announcing this change, Mr. Hamlin speaks in the highest terms of his relations in the past with this company, and regrets that the change seems to make the severance of this connection necessary.

The American Telegraph & Telephone Company courteously announced that it will be pleased to allow convention attendants the free use of its telephone wires for long distance messages after 6 p. m., upon displaying the convention badge.

Mr. T. C. Penington, who was secretary and treasurer of the American Street Railway Association for ten years, is largely in evidence at the conventions. Mr. Penington severed his connection with the Chicago City Railway Company last spring and after a summer vacation is ready to form a new connection.

Mr. N. A. Christensen, who recently made over to the Allis-Chalmers Company the exclusive rights to his air brake patents, sent down a four-cylinder Peerless automobile for the use of the "boys" representing that company. This makes them popular with the street railway men, many of whom are enjoying rapid transit between the hotels and the fair grounds.

Paul Winsor, president of the New England Street Railway Club, Boston, Mass., is here attending the convention. It was noted today that four other men who have served as president of this popular club are now in Columbus. They are E. E. Potter, of New Bedford, Mass., J. H. Neal, of Boston, H. E. Farrington, of Boston, and E. C. Springs, of Dayton, Ohio.

Mr. C. N. Wilcoxon, general superintendent of the Western Ohio Railway Company, of Lima, Ohio, will arrive in Columbus today to attend the convention. Mr. Wilcoxon started for this city yesterday in the private car "Van Wert," but was compelled to leave the party before the car had left his company's property to attend to some business that demanded his immediate attention.

The Electric Service Supplies Company of Philadelphia, Chicago and Keokuk, has the reputation of doing everything well. The high class of all the rest of its exhibit obtained also in the music with which the exhibitors and visitors in building No. 1 were regaled yesterday. One of the company's convention souvenirs is a memorandum book which this company is distributing to its friends.

Several prominent members of the Claim Agents' association were visibly surprised yesterday when trying to find the place where their meeting was being held, at finding themselves apparently hemmed in on every side by a strong wire fence. One of them remarked that it must be that the authorities were under the impression that it was a live stock show that is being held and that the members were "it."

Probably it will never become affiliated with the American Street & Interurban Railway Association but nevertheless an organization has sprung into existence in the last two days which bids fair to be of at least temporary importance. It is known as "The Grape-Seed Society," and its members are composed exclusively of exhibitors whose space is in Building 6—otherwise known as the "Vermiform Appendix."

A party of twenty-five of the officials of electric railways whose offices are located at Lima, Ohio, arrived in Columbus early last evening in the private car "Van Wert," which is one of the official cars on the Schoepf system of railways. The party was in charge of F. T. Hepburn, general manager of the Lima & Toledo Traction Company. Others in the party were A. Benham, general superintendent of the Lima & Toledo Traction Company, F. A. Bundy, master mechanic of the syndicate lines running into Lima, F. D. Carpenter, general manager of the Western Ohio Railway Company, Mr. Gray, chief despatcher of the Western Ohio Railway Company, and F. R. Fahlsing, claim agent of the Fort Wayne & Wabash Valley Traction Company. The car left Lima at 8

a. m. yesterday and made the run to Columbus by way of Dayton without a single hitch in the schedule as previously laid out for the trip. Luncheon and refreshments were served en route.

Some interest has been expressed in reference to the location of the exhibits of the Westinghouse Companies and of the General Electric Company—on opposite sides of the cooler. As shown by the plan of the exhibit buildings the cooler is about 20 by 20 by 60 feet and therefore capable of supplying much coolness when its refrigerating apparatus is in operation. Perhaps it may not, under the circumstances, be necessary to put it in operation.

The question has arisen whether the whole of the Westinghouse exhibit is contained in the space allotted to the several companies within the Fair Grounds. The inquiry was inspired by the sight of a place not far from the entrance to the grounds bearing on the sign the name "George Westinghouse." It is not known whether the place has been established to secure the patronage of the 60 odd representatives or whether the name is merely a guarantee.

The Massachusetts Street Railway Association with its usual foresight chartered a car for its party from Boston to Columbus. The buffet of this car was stocked with ample provisions and the fact that the Southwestern Limited was three hours late, gave little uneasiness. They fared sumptuously and were happy while the occupants of the other coaches on their train were clamoring for a dining car and looking longingly for a lunch counter along the route.

Canada and Mexico are well represented at the conventions but the man who has probably taken the longest journey to reach Columbus is Mr. Lloyd Lyon, assistant treasurer of the San Juan Light & Transit Company. Mr. Lyon had spent nearly six days on the way before arriving at Columbus on Sunday, but reports an excellent trip and believes the conventions worth the long journey. He says that his company is prospering and has been obliged to make several improvements to handle the traffic offered.

Though not generally known among the convention attendants, a most interesting operation for appendicitis was yesterday afternoon performed upon the Fair Grounds. The officiating surgeons were the exhibitors in building No. 6, otherwise known as the "Vermiform Appendix." A large delegation waited upon the exhibition authorities with a view to ascertaining what could be done to secure the removal of the obstruction existing in the form of locks upon the outer door at the south entrance of the building. As we go to press it is believed that the condition of the patient promises recovery.

Having ingratiated himself into the favor of the man who had the good fortune to draw the room with the bath at one of the convention hotels sufficiently to enable him to ask the loan of facilities for a bath, our poet, who is paid a surpassingly high salary for the purpose of having inspirations, had one at the same time when he was having his bath. The splash of the waves around his feet reminded him of those classic lines of Coleridge, the great English poet, which run like this:

> The river Rhine, as is well known,
> Doth wash the city of Cologne;
> But tell me nymphs, what power divine
> Shall henceforth wash the river Rhine?

Then with that versatility which marks the newspaper man in turning to the uses of the present the treasures of the literature of the past, he revolved in his mind the following version of Coleridge:

> Columbus' river, Scio-to,
> Doth flow into the Ohi-o;
> Ohio's floods, with mud replete,
> Show when Columbus bathes its feet.

CONVENTION PROGRAMME.

Tuesday, October 16.

Accountants' Association.

10 00 A. M. to 12 30 P. M.

Convention Called to Order.

Address of Welcome — By P. V. Burington, Secretary, Columbus Railway & Light Company, Columbus, O.

Address — Hon. W. Caryl Ely, President American Street & Interurban Railway Association.

Address — Prof. Bernard V. Swenson, Secretary American Street & Interurban Railway Association.

Annual Address of President.

Annual Report of Executive Committee.

Annual Report of Secretary and Treasurer.

Appointment of Convention Committees.

2 00 P. M. to 5 00 P. M.

Paper —"The Accounting of Capital Expenditures," by P. S. Young, Comptroller, Public Service Corporation of New Jersey, Newark, N. J.

Question Box.

Convention Photograph.

Engineering Association.

10 00 A. M. to 12 30 P. M.

Report of the Committee on Standardization.

Paper —"Gas Engines," by Paul Winsor, Chief Engineer Motive Power and Rolling Stock, Boston Elevated Railway Company, Boston, Mass.

Paper —"Underground Cables," by H. G. Stott, Superintendent Motive Power, Interborough Rapid Transit Company, New York.

Discussion of the Question Box.

2 00 P. M. to 5 00 P. M.

Paper —"Relative Economy of Turbines and Engines at Various Percentages of Rating," by Walter Goodenough, Engineering department, Stone & Webster, Boston, Mass.

Paper —"Economy in Car Equipment, Weights, and Schedules," by E. H. Anderson, Schenectady, N. Y.

Discussion of the Question Box.

Claim Agents' Association.

10 00 A. M. to 12 30 P. M.

Paper —"Which is the Better Policy, Quick or Delayed Settlements?" by A. J. Farrell, Claim Agent, International Railway Company, Buffalo, New York.

Paper —"The Policy of the Claim Department Toward the Public," by W. F. Weh, Cleveland Electric Railway Company, Cleveland, Ohio.

2 00 P. M. to 4 30 P. M.

Paper —"The Claim Agent's Work of the Future," by C. Willis Hare, United Gas Improvement Company, Philadelphia, Pa.

Question Box.

Discussion —"The Relation of Statistical Bureaus to the Claim Agent's Work," by Russell A. Sears, C. S. S. Miller, Bayard P. Holmes, and William DeMilt Hooper.

Mr. George M. Hoadley who is in attendance as a representative of the Keystone Brake Shoe Company, was on October 1, appointed eastern sales agent for the company in charge of the electric traction department. Mr. Hoadley is not unknown to the officials of street and interurban railways, having been connected at one time with the Peckham Manufacturing Company and also having been identified with the Bemis truck. The company with which Mr. Hoadley is now connected, is making its initial bow to the electric traction interests and has had the Keystone brakeshoe under successful test for some time past. The president of the Keystone Brake Shoe Company, Mr. C. H. Platt, formerly general manager of the New York, New Haven & Hartford, is in attendance at the convention together with Mr. Hoadley and Mr. V. B. Lamb, the inventor of the Keystone shoe and general manager of the company.

ENGINEERING ASSOCIATION, MONDAY MORNING SESSION.

The fourth annual meeting of the American Street & Interurban Railway Association was held at the State Fair Grounds, Columbus, O., October 15-17, 1906.

The president called the meeting to order at 11:15 o'clock.

President Adams then introduced Mr. E. C. Spring, president of the Central Electric Railway Association, who welcomed the members of the Engineering association to Columbus, Ohio.

Mr. Spring stated that the Columbus meeting will be an inspiration which will permeate the electric railway field, and call forth general activity that will produce great benefits to the industry at large. An invitation was extended for the delegates to visit the railway properties in the states of Ohio and Indiana so that they might better see for themselves what is being done.

The Engineering association, to the speaker's mind, occupies one of the most important positions in the electric railway world, inasmuch as the gigantic task of standardizing equipment has been placed at its door and the entire electric world is watching the results which will be the outcome of its deliberations, and until that time comes, when equipment, from rail to wire, is standardized it cannot be hoped to gain the results in operation that will result at that time.

President Adams, then, in the absence of President Ely, called upon Mr. James H. McGraw, president of the Manufacturers' association, who said that the Manufacturers' association, as an ally of the American Street Railway & Interurban Railway Association, stands ready to help in every possible way. Its members believe that never before have the manufacturers placed in position such an ideal exhibit, so comprehensive and so well done as is the present exhibit here in the city of Columbus. That never before has the arrangement of buildings been as satisfactory as this year which with the hospitality of the city of Columbus has facilitated the work of preparing for the convention.

Mr. McGraw said further the Manufacturers' association feels that the way the parent and the affiliated associations have been affiliated is on right lines, is broad-gauged and comprehensive; that the parent organization and its affiliated associations are to become the greatest technical and scientific organizations that this country affords in any field of activity, and the Manufacturers' association, as allied with these organizations, will do its full part in every particular.

The minutes of the last meeting were next approved.

President Adams then called upon Mr. John I Beggs, first vice-president of the American Association to address the association.

Mr Beggs said that he looks with a great deal of pleasure and satisfaction, on the growth of the affiliated associations. for, after all, the great benefits which the important electric railway industry is to derive, must come from the work of members of the affiliated associations. The managers, those in positions of administration, may plan ever so well, but unless they can have intelligent, energetic, enthusiastic associates in the management of their various departments, no matter how strong they may be in the affairs of administration, such managers will not have attained all that is possible.

President Adams then delivered the customary annual address, which will be found elsewhere.

Mr. W. B. Brockway, president of the American Street and Interurban Railway Accountants' Association, next extended an invitation, welcoming the members of the Engineering association to the meetings of the Claim Agents' association.

Secretary Mower then read the minutes of the various meetings of the executive committee, which had been held during the fiscal year. This constituted the report of the executive committee. These minutes embody the record of the work transacted by the committee in the management of the association and the arrangements made for the annual meeting.

Secretary Mower, when called upon, stated that during the past year the matter of members has been entirely in the hands of the secretary of the American association, and that a detailed report of the year's work would be presented on Wednesday, October 17. This report will be considered as that of the Engineering association.

Secretary Mower then presented his report as treasurer which showed the receipts during the year to have been $2272.63; the expenses $2109.97, leaving a balance of $162.66.

President Adams stated that the American association recognizes that the Engineering association is doing the work in the manner in which it should be done, and now that the reorganization is on a substantial basis, the expenses of the various engineering committees will be taken care of by the main association.

The chair then announced the appointment of a Committee on Resolutions to be made up as follows: Mr. G. J. Smith, of Kansas City, Mr. Charles Hewitt, of Philadelphia, and Mr. E. W. Olds, of Milwaukee.

Secretary Mower then read a letter from Mr. S. L. Rhoades, president of the Claim Agents' association, inviting the members of the Engineering association to be present at the meeting of the Claim Agents' association; also a letter from Mr. W. O. Thompson, of the Ohio State University, extending an invitation to the delegates to visit the buildings of the university; also a letter from Mr. E. A. Read, representing the Central Union Telephone Company and the American Telephone & Telegraph Company, extending the courtesy of lines of these companies, the long distance. service to be used after six o'clock at night.

Secretary Mower then read a letter from Mr. H. Wallerstedt. chairman of the Standardization committee, regretting his inability to be present at the meeting.

(Adjourned until afternoon.)

President Adams called the meeting to order at 2:10 p. m., introducing Mr. W. Caryl Ely, president of the American Street & Interurban Railway Association.

Mr. Ely spoke first of the success of the re-organization of the association, saying that the Engineering association is one of the most important branches of the reformed organization. It is one that appeals in the strongest possible way to some of the largest members of the association, especially those in the great cities that are operating elevated ways, subways, etc., and the number, as we all know, of those companies, is rapidly increasing. The organization of a separate association among the larger cities that have those distinctive properties, has been mentioned and Mr. Ely said that he would favor the organization of such an association, unless it should take the form of an instrumentality injurious to the parent organization; if it takes that form, he would be unalterably opposed to it and do everything in his power to oppose any such organization. Mr. Ely stated that he took this occasion to make this statement because some of his listeners are members of those great companies, and he thought that notice ought to be served in a manly and firm way, that there is room for both, and that there might be such an organization and still the benefits of the present organizations be as great or even greater, than as if it did not exist. The speaker called upon the Engineering association and its members to be mindful of the great benefits which come from these associations and to the firm friends of this group of associations.

Mr. J. S. Doyle presented the report of the committee on Control Apparatus.

Report of Committee on Control Apparatus.

The quesion of multiple-unit control was exhaustively treated at our last convention in a paper presented by Mr. Hugh Hazelton, and it is gratifying to note that the use of multiple- unit control apparatus for heavy service has increased during the year so that its use for new equipments has become the rule rather than the exception.

Both the General Electric and Westinghouse companies have continued to develop this type of apparatus in the respect of reducing the weight and number of parts, and also increasing the pressure between the contact points of the switches. This latter development may be said to be the greatest improvement accomplished.

The committee noted at the last convention that the greatest amount of interest was shown in the standard street car control problem, and Messrs. Olds and Adams made the statement that they had followed suggestions of previous conventions and were then installing equipments with contactors located beneath the car, which was for the purpose of obviating the platform cylindrical control failures that have been so generally complained of in the past. This particular type of control has been in service some time now, and the committee expects an interesting report from these gentlemen.

A number of the members of this association were very strongly of the opinion that the multiple-unit type of control of standard street car service could not be reduced sufficiently in size to permit of installation in the limited space afforded by the ordinary car, but the committee is pleased to state that both manufacturing companies have been working with this end in view, and have succeeded in reducing this control equipment so that it can now be installed on the standard street car.

The great efficency of the larger types of multiple-unit control also obtains in the smaller sizes, so that this apparatus should be a great improvement over the present practice.

Progress has been made by each of the manufacturing companies on control apparatus for heavy railway locomotive work. Single switches having a capacity of from 1,000 to 2,000 amperes have been developed, but inasmuch as these locomotives have not as yet been placed in regular service this subject shall have to be deferred until the next meeting, at which time the control committee hope to have a more extensive subject to work upon.

President Adams called for discussion regarding the multiple-unit control as applied to the single car units. Before declaring the discussion on this report open, I want to say that unfortunately we have been very late in getting out the advance papers, and as far as it is possible we will endeavor to have the author of each paper read the paper or abstract the same as completely as possible in order that the members present may be thoroughly informed as to the subject to be discussed. This committee on Control Apparatus has submitted its report, and I would like to ask if there is any one in the room who can give us any information upon the multiple-unit control as applied to the single car units.

Mr. G. J. Smith stated that the Metropolitan Street Railway of Kansas City, Mo., had in service for three months past, 30 cars, 30 feet 7 inches long over corner posts, with the type M multiple-unit control operating as single units, and from present indications the results will be so far superior to the platform controller, that the management is considering the installation of this control on 120 of the same type of equipment, and doing away with the platform control. Multiple-unit control is favored because it does away with panics caused by the blowing-out of controllers operated on platforms. In Kansas City the grades are quite steep so that at times the motors take 800 amperes, at 575 volts. The average amperage one the Troost Avenue Division is 153, on 10 seconds reading. Such currents are too heavy to handle on the platform without danger of having not only the automatic breakers opening, but the controllers short-circuiting and causing a panic on the car.

Mr. E. W. Olds stated that last year the Milwaukee Electric Railway & Light Company put into service 50 cars with contactors in series with the controllers. The contactor itself, in throwing off the current, opens a little ahead of the conrollers. The cars first equipped with the controllers caused a little trouble on account of mechanical defects in the construction of the control circuit-breaker. That was remedied by the manufacturer, since when they have been working satisfactorily. No controller blow-outs have been experienced. Should a short circuit occur in operation, as will occur occasionally on any platform controller, the motorman can at once throw his handle to a position which stops the burning. The use of contactors has been found to be very satisfactory. The company at this time is equipping 75 more cars with that type of control.

The work that has been done by the manufacturers to reduce the size of the type M and pneumatic control so that they can be placed under ordinary city cars has been very satisfactory.

Mr. Olds said further that the Milwaukee company is installing individual fuses for each motor, so that if a short circuit should occur on any one of the motors, the fuse protecting that motor would blow. This practice has been found satisfactory. With the old type, very often, should a short circuit occur, the arc would start, which on account of the resistance would cut down the amperes so that the circuit-breaker main-fuse would not blow, but the arc hold. In the operation with the individual fuses, one of them will blow should a short circuit occur, which of course stops the burning.

President Adams stated that the Baltimore United Railways & Electric Company early this year, put in service four-motor equipments on cars that are 30 feet 8 inches over corner posts, weigh about 49,000 pounds, and have four 65-horsepower motors. At the same time this company put in service 160 equipments of four-motor cars, weighing about 45,000 pounds, with four 40-horsepower motors. These equipments had the K-28 B control, the first having type K-28 control. Excellent results have been had with the K-28 F, or the contractor combination. A considerable saving in the item of cylinder and contact fingers is noticed. The use of contactors reduces the amount of work in taking care of that part of the controller. The cars thus equipped have been in fairly heavy park and other service this past summer. These cars carried anywhere from 100 to 125 passengers on a load with a long haul, which was a severe test well stood by the control apparatus.

Mr. F. E. Chase, when called upon, stated that the General Electric Company had furnished contactor equipments for a large number of cars that were not intended for multiple-unit operation. The railway managements in many instances, have thought that ultimately they would run two cars or perhaps three cars, but after operating for several years, many of them have not added the second car for various reasons, largely due to the trouble with the drawbars on short curves. The chief advantage for the contactor control is that it is located under the car. It not only provides a greater factor of safety as far as not arcing, but it also removes the arc to a point where the passengers will not notice it, should any such arc occur. Some cars have been equipped with an automatic switch or circuit-breaker located in the vestibule, which will open the control circuit when an excessive current flows. This permits the contactors to drop and operate as circuit-breakers. These contactors also operate each time the controller is turned to the first point. In many of the equipments which have been furnished, not only does the control open on the first point, but also during the transition from series to parallel, thus preventing in the case of a damaged motor or rheostat or trouble with the wiring, any severe arc that occur at these points.

Mr. W. H. McAloney, of Denver, asked Mr. Case what switch-box or controller is best adapted to handle the 100-horsepower with one-way cars where the cylinder platform-control is not considered as serious as on double-end cars, and where K-10 and K-6 controllers are used with two 50-horsepower motors.

Mr. Case stated that the K-11 controller is the one that is furnished for use with the two 50-horsepower motors. The addition of two contactors will greatly benefit the operation, as they will assist in opening the circuit under the car, but there is not the necessity for these that there would be perhaps on an open car where passengers use the front seat.

Mr. E. W. Olds said that in Milwaukee the company operates from both ends of the cars. The city cars are equipped with 160-horsepower motor capacity and the speaker did not think it safe to operate the cars with the ordinary K type of controller without something in the circuit which will open in case of trouble. It was found practically impossible to place the type M control under the car but the contactor itself helps out and reduces the repairs to the controller on account of the burning of the controller. It is thought that the life of the contacts is increased at least twofold.

Mr. Paul Winsor stated that the Boston Elevated Railway Company had fitted up 40 cars that have two 65-horsepower motors with multiple control. At first a great deal of trouble was experienced with the controllers, but that has been pretty well weeded out and the cars are giving such good satisfaction that the company is now equipping 50 more cars that have larger motors on them.

Mr. Winsor stated that his company is now experimenting with two cars coupled together, using an extra set of contacts, extra contact plates in the reverse circuit on the off position. Two cars are coupled permanently with a slide drawbar (no coupler), which does away with the scrapers and platform controllers between the cars. With that extra set of plates on the off position of the controller, it is possible to control from the front platform, two motors on each car with three wires between the cars. This is only an experiment.

The multiple controllers used are giving very good satisfaction, now that we have worked out a lot of those troubles, but it is not thought that the platform controller is perfect for any size motors. Trouble is had not only in case of short circuits or partial short circuits, but there is a good deal of trouble in passing from series to multiple where one of the motors has a spinning wheel.

Mr. Case said that below 200-horsepower the cost for multiple control is relatively higher than it is when it is installed in larger capacities. From an engineering standpoint he would much prefer multiple-unit type of control for all cars.

Mr. Storer: I am very gratified, Mr. President, to have an opportunity to present the question, but my friend, Mr. Cooper, is better qualified to speak upon the subject than I am, as he is in immediate charge of the control, and with your permission, I will yield the floor to him.

Mr. William Cooper did not quite agree with Mr. Case in placing the limit at 200-horsepower, but thought that amount a little high. He could not see any reason why there should not be as successful operation or control on smaller equipments provided the controller is small enough to meet the conditions. The point of getting all of the higher voltage wiring, the main circuits, under the car and keeping them off the platform, seemed to be the main consideration. If the controllers were small enough so that they could be put on an ordinary car it would seem that it would be a desirable thing to do. Mr. Cooper stated that the Westinghouse company had developed a controller which is small enough to go on almost any car. It has a capacity of two 100-horsepower motors, or even more, up to about 300-horsepower total. A controller 16 inches long, 14 inches wide and about 15 inches deep weighs from 300 to 325 pounds. It seems that is not an excessive weight or size for almost any car that it might be put on. There are some considerations which go with it as far as location is concerned. And for smaller equipments, a so-called "switch-screw" is used. For larger equipments, up to say four 75-horsepower motors, a line switch is added for safety's sake, and also as a part of the combination in the controller circuit. The largest installation made with that size of controller is four 90-horse-power motors. In that case two separate line switches are used, and these are of about the same general construction, with only one switch in each box. They weigh 60 pounds each. That equipment would seem to be, the switch group alone, adaptable for small cars, and even if that were found to be too large for small equipments there would be no question at all about making it still smaller.

To serve the purpose of a fuse in each motor circuit, in the case of two-motor equipments, an overload trip is placed in each motor circuit. This little switch group has two overload trips, one in each motor circuit or, in the case of four-motor equipments, of course, if the two motors are parallel, it would be in the circuit of two motors. This switch operates to open all the contactors, all the switches in a circuit and cuts off the circuit entirely from all the circuits of the car. It is all done simultaneoulsy.

Mr. Hall, of Boston, stated that the Boston & Maine Railroad has been operating at Concord, N. H., for about five years, 22 cars, 34 feet long over corner posts, equipped with type M control. These have been operated singly and in trains with very good results.

Mr. Paul Winsor said that on the elevated and surface cars in Boston the automatic and not the type M control is used.

Mr. Smith, of Kansas City, stated that a little incident which might have been serious had brought to his mind a scheme for operating the reverser mechanically. A car was running on a grade of about four per cent; the conductor tried to apply the brakes and found the connecting rod on his brake cylinder broken. He tried to reverse his car, and it was an impossibility. The car coasted for two miles, and over three railroad surface crossings before it came to a stop. Although no damage was done, there might have been. Then the necessity of having a mechanical appliance to throw the reverser was thought of. The small fuse in connection with the windings on the reservoir had burned out. The man did not know it of course, having been running the car one way all day. To prevent a similar occurrence an arm was connected to the D. B. 22 reverser, and by a system of bell cranks and levers, connected with a lifting pull lever on the platform. Thus the man has the car under absolute control, although his brake might fail at any time. This scheme is also applied to all new equipment. Any city where there are grades, should, in the speaker's opinion, regard such reversing mechanism just as essential as the type M control, because a crew is absolutely helpless otherwise, if any part of the brake apparatus gives out, or if a fuse blows. There have been five occasions when the motorman did save collisions or other accidents by the use of this device for mechanically throwing the reverser and making generators of the motors.

Mr. Olds stated that in regard to broken brake-rods, that he hardly considered it safe or good practice to use the single-end cylinder or cylinder with one piston. On his road two pistons are used in one cylinder, so that should the brake-rod break, the brakes are useful on one truck at least.

Mr. Smith stated that in Kansas City the company put a brake cylinder at each truck. This was done, not only as a factor of safety, but to get room to apply the hand-brake apparatus without connecting any part excepting the brake levers with the hand brake and the air brake, that is, leaving the hand brake absolutely separate from the air in every way.

A paper on ties, poles and posts was then read by Mr. C. A. Alderman, chief engineer, Cincinnati Northern Traction Co., Cincinnati, O. This appears elsewhere.

Prof. A. S. Richey, of Worcester, Mass., stated that the figures given by Mr. Alderman were very significant and surely meant that ties, poles and posts, the timber that is used in construction, will soon have to be treated in some way to increase its life, or else some other material must be used, as steel or concrete, or a combination of the two, for the purposes for which wood has been used.

The speaker had heard it stated, and believed it true, that the end post on the fence, and the method of putting them up and of stringing the fence is of 75 per cent more value to the fence than are the posts and the method of setting them between the end posts. He said further that Mr. S. H. Kelsay of the Indiana Union Traction Company had proposed the use of steel-lattice pole about 42 feet 6 inches long, to carry the trolley brackets that are used for telephone and alternating current wires, the pole being constructed as a three-legged tower. Such poles weigh about 500 pounds and cost about $20. He proposed to use the poles with spans of about 200 feet and use catenary construction on the trolley wire, that is on the straight line. The telephone and lighter wires, of course, would have to be spaced out on the cross-arms to keep the vibration from crossing them. Professor Richey thought it probable that some such construction as that will be more economical than the use of wooden poles at the rate at which the price of wooden poles is going up, and considering the relatively short life of wood as compared with such a steel tower set in concrete. He knew of some cedar poles which have been in use in the ordinary span-wire construction on city streets for about thirteen years. When these poles were closely examined around the surface of the ground, where the rotting generally takes place first, and just below the surface of the ground, probably about one half of them showed evidence of having been painted with some sort of paint when they were put in. Others did not show that. In almost every case the poles which did show evidence of having been painted were in a great deal better condition, and had hardly rotted at all at the top of the ground where the others were badly rotted. This seemed to indicate that even the protection of some sort of paint kept the moisture out at the top of the ground, and did a great deal of good in that case.

Mr. F. G. Simmons stated that in Milwaukee on the interurban lines, as well as on all other places where poles are used for lighting purposes, all poles are set in solid concrete. The concrete is brought to or a little above the ground line and a collar or a thread two or three inches in depth and about an inch in thickness is placed all around the pole where it projects above the ground, thus forming a channel which is filled with a paving cement or tar mixture. This prevents the cracking of the concrete base, which is easily smoothed off and made sightly at the ground line. That is formed up on a slight elevation and the water or moisture passes away rapidly, and very little decay is found, or, rather, the period of decay is put off a much greater length of time than would ordinarily be the case. The speaker believed that the process of injecting the base of the pole with a preservative fluid to a short distance above the ground line might be advantageous.

Mr. Simmons stated that the papers read by Mr. Alderman and Mr. Clark would comprise the report of the committee on Maintenance of Way. In fact the report from the committee in charge of way matters must necessarily have been the reading of the two papers.

Mr. Lamb, of Toronto, described some concrete pole work that is being done at St. Catharines, Ont. There is a very deep valley running through the center of the town across which a 20,000-volt line is being built. In order to save going down and following the contour of the ground it was decided to put up two 150-foot poles, which were built of reinforced concrete. The poles are roughly about two feet square at the base and they taper. They are square throughout except the tapering and a slight bevel on the corners. They weigh somewhere about 55 tons apiece. They were built on the ground horizontally, and then raised by means of a derrick. The first one was broken in putting it up because it was not lifted at enough points.

Mr. Kelsay, of the Indiana Union Traction Company, said that concrete poles might get out of alignment on account of their excessive weight, unless the base of each pole was made very large. For that reason he thought that the steel tower with the feet spread possibly five feet or more, would make a more stable construction and possibly be as cheap as the concrete pole.

Mr. G. F. Smith stated that some white cedar poles, spaced 100 feet apart, had been in service 13 years in the western end of Missouri.

Mr. F. G. Simmons of Milwaukee, said that the Milwaukee system has about ten miles of road in which the poles were placed between eight and nine years ago. These are white cedar poles, spaced a little over 100 feet apart, and on a recent inspection about six or seven per cent of them, only, showed a necessity of replacement on account of rotting at the ground line. These poles were placed without any protection at the base.

Mr. E. J. Dunne, of the Public Service Corporation, of New Jersey, stated that with good, sound first-class cedar poles, the average life would run from 15 to 20 years. In his estimation the wooden pole has double the life of the iron pole.

Mr. Thomas Hawken, of Rockland, Me., stated that he had seen a pine pole that has been set in cement, which had been in use for 30 years which was badly decayed at the top, but when cut down was found to be sound at the bottom.

Mr. H. B. Fleming said that the Chicago City Railway Company has several miles of pole line, practically all within the city limits, of white cedar, and it has been in service since 1893. In connection with the statement made by Mr. Simmons he related that in the early days of the use of tubular poles in Chicago, his company set a ferrule around a pole at the ground line. The poles were set in cement and the ferrules were placed just at grade. A space of about two inches between the outside of the pole and the inside of the ferrule, which was filled with a bituminous compound. After these poles had been in service for several years, it was found that there was a tendency for the iron pole to rust at the top of this ferrule or iron collar, since which time the use of the collar on the base of the iron poles has been discontinued.

Mr. Paul Winsor stated that in Boston the company is reinforcing 700 poles with ferrules spaced one-quarter or three-eighths inches from the pole, and filling the space with liquid concrete for strengthening the iron poles that have rotted out.

Mr. F. G. Simmons suggested that possibly an explanation of the undue corrosion of the iron poles, of which Mr. Fleming states, may possibly have been due to the nature of the compound used in the collar.

A paper on "Ballast" was next read by Mr. Charles H. Clark, engineer of maintenance of way, of the Cleveland Electric Railway Company, Cleveland, O.

Mr. F. G. Simmons endorsed the conclusions in Mr. Clark's paper, stating that the last phrase in it corresponded exactly with his own belief and with the practice in Milwaukee. In Milwaukee not white oak ties, but cedar ties were used, spaced two feet from center to center; six or seven inches of solid concrete was put under the whole trench, the whole concrete brought up around the ties and in the case of 7-inch rail, an inch above the ties. He believes that by using that style of construction the 12 years ordinarily designated as the life of the cedar tie has been increased, and that the concrete preserves the wood of the tie, whether white oak or cedar, to such an extent that its life becomes almost indefinite. Track laid under almost similar conditions where the cedar ties have been in 16 and 18 years had been taken up and for the new construction anywhere from 40 to

60 per cent of the old ties could be used again. As to ballasting in city construction, he agreed with Mr. Clark's final conclusion. Ballast on interurban lines, he believed, was an entirely different question. Continuing, Mr. Simmons suggested that the work of the association be made parallel to that of the American Engineering and Maintenance of Way Association. As an example of the specifications for ballast were cited as follows:

"Stone ballast; recommended specifications.

"First, quality.

"(a) Stone shall be sharp enough to resist the disintegrating influences of the climate where it is used.

"(b) It shall be hard enough to prevent pulverizing under the treatment to which it is subjected.

"(c) It shall break in angular pieces when crushed.

"Second size.

"(a) Maximum size of ballast shall not exceed pieces which will pass through a screen having 2-inch holes.

"(b) The minimum size shall not pass through a screen having three-quarter inch holes."

Mr. Simmons said he took this matter at length because he believed there were many present who were particularly interested in the ballast, that should be used on interurban lines under conditions similar to those of steam lines. He would like the interurban men to take the discussion and suggest to the convention and to the executive committee and the standing committees of the association what they thought should be considered, and the method that should be pursued in that consideration.

Mr. C. A. Alderman, of Cincinnati, said he wished to speak as the representative of an interurban road. In central Ohio during the past few years they had been inclined to believe that concrete under ties was not the best thing to use. While his company was now laying some track in Columbus, using solid concrete bottom, under the T rail, it was doing it against its own wishes, as a concession to the city in return for the permission to use T rails. Concrete for heavy interurban cars, weighing 70,000 pounds, and going at a high rate of speed, was difficult to make so it would not break up, and when it broke up it disintegrated and was not much better than so much ashes under the track. He believed it very difficult to get a track laid with as little as six inches of concrete under the rail, and have it so that it would stand the traffic of interurban cars coming into the city. Several cities in this neighborhood had specified gravel and broken stone for ballast, and have discarded the concrete. Dayton allowed nothing but T-rail, with gravel or broken stone ballast. Indianapolis was not quite as pronounced, but a good deal of track there was laid with gravel and broken stone ballast. In Columbus, though they are not allowing the two things to go in at the same time—with T rail concrete ballast was required, but with girder rail gravel was sometimes allowed. Cincinnati was experimenting with track laid on broken stone ballast and nearly all of the smaller towns through which the interurban cars pass were allowing gravel ballast to be used instead of concrete. He considered there were many arguments in favor of loose ballast instead of concrete; it made a better riding track, was more easily repaired, and it did not break to pieces; it could be laid in cold weather, and if properly laid, it would answer the requirements. In his work with concrete he had used a mixture of 1-2½-5, Portland cement.

Mr. Clark stated he had had a great deal of experience in the use of concrete, having built a large dam 60 feet high, and that has stood well, and the proportions were 1-3-5. One of the speakers had thought that concrete would be pounded up, but he did not believe this would happen if the right proportions were used and the material measured accurately, and not thrown together in wheelbarrows in trying to see how cheaply it could be done. If concrete were made carefully, he did not believe it will disintegrate. It became necessary recently to take up some of the track laid in concrete for four years and it had to be taken out with chisels and sledges. The Cleveland Southwestern cars had been running over the tracks for four years and these cars were as heavy as any cars in the country.

Mr. J. M. Larned, of Pittsburg, said that his company placed the ties on a stone ballast; where necessary to support the pavement concrete was placed between the ties, but no attempt was made to support the ties with concrete. His personal belief was that any track, which had as much money spent on it as was necessary to build a concrete track should last, without attention, for five years. A good track could be built on rock ballast which will last, under a city street, for eight or nine years without receiving any attention, so that a life of four or five years for the concrete under the ties was not much of a test.

Answering a question, Mr. Alderman said the only cases where his company had had to use broken stone has been in the northern part of the state. All through the central and southern part of Ohio excellent gravel could be had and it was considered as good or better than broken stone. If absolutely necessary to use broken stone, he thought the idea of using gravel with it very good. Any ballast might mix with the soil underneath it. In a well ballasted track, however, in city streets, his company did not find that the gravel or broken stone pounded down into the soil as much as on grades outside.

Mr. F. G. Simmons, answering several criticisms made regarding concrete for ballast, said he believed that the efficacy of a concrete ballast was a matter of workmanship; also that the Milwaukee standard construction, had in some cases been in nine years, and had not been looked at yet. It was tried to have the concrete mixed of a combination of one part best Portland cement, 2½ parts of sand, and five parts of rock. If cars were kept off the track, and also other traffic, for the matter of six or seven days, the concrete would have enough time to properly settle and there would be no trouble with the construction afterwards. That also presupposed the proper treatment of the foundation below the concrete. After excavating on city streets, and digging a trench it was considered necessary to make the foundation very solid, and it was rolled with heavy rollers, or tamped with tamping bars, or flooded.

Mr. H. B. Fleming, of Chicago, cited cedar ties which had been in service there since 1887, and two years ago when rebuilding track on account of the construction of a new sewer, the ties had been found so well preserved that they were replaced in the track. The only objection to cedar ties was on account of the wood being soft that it is hard to hold the gauge. As to steel construction he believed that where the traffic is very heavy and rails wear out quickly the sub-structure should be so designed that it would be possible to re-lay the rails without re-laying the substructure. He suggested that a renewable plate be placed between rail and tie which would make it possible to re-lay the rails on that tie without resurfacing the tie.

Mr. Clark suggested the use, when re-laying the rails, of different size shims.

Mr. Fleming said he had found the shims themselves were soon destroyed, and the track went down to the original substructure.

Mr. F. G. Simmons and Mr. Clark express lack of confidence in concrete beam construction.

Mr. M. A. Schreiber (Public Service Corporation) said he believed in the stone ballasts under the tie, and used altogether the wood tie, good quality white oak or chestnut. In laying down a track there were two things to be considered, not only to put down a good track, but to think of the rolling equipment. The track must not be too rigid.

Mr. Simmons considered that the amount of cushion which the wooden tie gives was all that the pavement could stand, and if to the cushion of the tie, were added the cushion of the loose ballast, there would be too much vertical motion of the rail and the pavement would be unduly distributed. The matter of cushion was a vital one, and this was one reason why he had always maintained a metal tie was only a last resort on account of the increasing price of timber.

Mr. Clark urged that if the track were perfectly rigid so that the pavement did not move, the cost of maintenance will be little for the pavement.

Mr. Paul Winsor, Boston, said it was his experience that unless water were kept out of the ballast there would be trouble. A concrete pavement, set in concrete block would preserve the track very much, because the water did not get in and did not churn under the ties, and the foundation stays put.

The report of the committee on Maintenance and Inspection of Electrical Equipment was read by the secretary.

Paul Winsor, Boston, said that his company had gone recently on to a mileage basis for inspection, both for surface and the elevated cars. For the surface cars the night starters at the various stations kept the mileage, using the register sheets for that purpose. The fare register sheets were made up by car numbers, following a car through the various routes that it ran during the day, so that by knowing the number of trips it ran on each route and referring to a mileage table of routes, the starter could very easily make up the figures. This inspection replaced that formerly made every three days; the brake-shoes, controllers and such things as were apt to give us the first trouble. The general overhauling was also done on the mileage basis, but at much longer intervals.

Mr. Doyle stated that on the Interborough equipment the motor armature bearings were oiled every thousand miles, irrespective of time and the motor axle and journal bearing were oiled every 10,000 miles. It was believed that the latter figure might be made 15,000 miles.

Mr. Evans asked Mr. Doyle to what extent the saving stated was directly due to the standardization of the equipment.

Mr. Doyle replied that the standardization perhaps only affected results as to the maximum time of mileage by reason of the type of the bearings. The maximum time now depended on the length of time the armature bearing would operate. Some had run up to 2200 miles, as a matter of fact, up to 2800 miles. It was not known whether this could be done and a reliable surface maintained and the mileage was being raised gradually. The design of the bearing was the waste oil thread bearing, similar to the car journal. He inferred from what Mr. Winsor had said that he had some motors of an obsolete type that required grease and a good deal of doping every night. If it were possible to gain these great economies, was it not advisable to capitalize the antiquated stock in service and do something towards getting some good stock. His company capitalized its failwherever it paid a change was made.

Mr. Olds of Milwaukee, said that with modern lubrication, that is, oil lubrication, with the bearings packed with wool waste, the life of the bearing had been increased to four or five times what it was with the old grease lubrication, and that the inspection did not need to be made so often. He had had a car run for 16 to 18 hours a day for three months with the armature and axle bearings lubricated but once. As to inspection he did not think there could now be laid down hard and fast rules, but that as the standardizing committee was able to advance in its work and reach some definite conclusion it would be possible to make great savings. As to the keeping of the mileage of the cars for inspection on the mileage basis, Milwaukee was not doing that. He believed in it and expected to put it in practice within the next year.

In lubrication, whether using oil or grease, by using a cup inside with a wick feed, Mr. Olds said he had been able to increase the life of the bearings about three times, as compared with the old grease method, but that did not equal the life with the newer or later lubrication, which is practically wool waste.

Mr. Olds, replying to a question, said the oil cups used were made of cast iron with a tube in the center, which is also cast, using a wire in the center of the tube with a loop in the end of it next to the bearing, going to within about ⅛ inch of the bearing, and passing through that loop two or three strans of wool yarn. These had given no trouble on account of not feeding, even in zero weather.

Mr. McAloney, of Denver, said that most of his troubles were with smaller matters and that a mileage inspection would be more difficult for these.

Mr. Doyle replied that the system of maintaining the mileage record could be very simple if put on a basis of car trips, and the reliability would be very greatly increased, even though the expenditure was the same.

President Adams said that this was certainly a very live question. His company was oiling motors once every five days and also the armature bearings; for bearings it was once every ten days. He knew, without doubt, that if, on a mileage basis the amount of oil used and the cost of labor would be reduced. He suggested that the use of a mileage basis be begun with modern equipments and develop the system and then work into the old equipments.

Mr. Winsor thought that most of the breakdowns in the old equipment came from such things as brush holders, but that it was easier to talk about oil than brush-holders. He thought they were all afraid to adopt the mileage basis, because it was an almost impossible thing to keep the records with the men they had on the cars. He believed the mechanical department could not depend on the accounting department for the mileage data. This has to be available first thing in the morning for what happened the day before. Therefore, the record was kept in the car house.

Adjourned to meet at 10 a. m. Tuesday.

WALLACE-COATES ENGINEERING COMPANY.

The Wallace-Coates Engineering Company, sole agent for and constructor of the Strauss bascule and concrete bridges, believes that interurban railway men will be interested in some late work of the Strauss Bascule & Concrete Bridge Company, of Chicago. This company has recently completed a re-inforced concrete bridge for the electric road between Elgin and Belvidere, Illinois, which is unique in being the first re-inforced concrete bridge built without the usual expensive centers and false work. The bridge was built for The Arnold Company, general contractor for the line, and embraces four arches of 81-foot clear span, each arch having two ribs and carrying a concrete floor slab in which the ballast is placed. There is no earth fill in this structure, and this fact coupled with the economy of concrete, due to the ribbed type of bridge, and the saving effected in the centering, makes the bridge one of the cheapest high-grade structures so far produced, and for this reason particularly applicable to interurban construction.

Equally interesting is the bascule bridge which this company is just completing near Rahway, N. J., for the New Jersey Short Line Railway, a high-speed interurban line between Philadelphia and New York. This bridge is a single-leaf, double-track structure, which cost less than the double-arm plate girder swing bridge originally proposed for this crossing. The bridge has the pivoted counterweight peculiar to the Strauss bascule, by means of which the usual counterweight pit, cast-iron counterweight and curved structural work are eliminated.

The Wallace-Coates Engineering Company has quarters at 355 Dearborn street, Chicago, Ill.

Mr. A. J. Farrell, claim agent of the International Railway Company of Buffalo, is at the Southern.

ANNUAL ADDRESS OF PRESIDENT ADAMS

The executive committee of the American Street and Interurban Railway Association decided this year to give special attention to the interurban field at the annual meeting, and, in determining upon the location for the convention, Ohio was selected as the state having the largest interurban mileage in the United States and this beautiful city of Columbus, the capital, was decided upon as one of the greatest interurban centers in the state, if not in the country. The wisdom of this selection is beyond question and the cordial welcome which we have received speaks well for the success of this convention.

This is the fourth annual convention of this association, the past three having been held under the name of the "American Railway Mechanical and Electrical Association." During the last year we have passed through the stage of reorganization and we stand today upon a much firmer platform than ever before in the history of the association. We are now connected in a definite manner with the main body, the American Street and Interurban Railway Association, and are linked closely with the other allied associations; that is, the Accountants' and the Claim Agents'. We have a representative upon the executive committee of the American association (or the main body) and the benefit of this is that our association has a direct voice in the general work of that body and especially as it relates to the allied associations, our financial condition has been decidedly benefited. Two thousand dollars was appropriated for the carrying on of this year's work and appropriations are to be made each year from the main treasury, as the requirements of the association demand.

At the convention held in Philadelphia the question of reorganization was placed in the hands of your executive committee, with power to act, and, in accordance with the resolutions passed at that time, this committee prepared the Constitution and By-Laws, which were finally accepted by the executive committee of the American association. The Constitution and By-Laws were arranged to conform in as many particulars as possible with the Constitution and By-Laws of the Accountants' and the Claim Agents' associations, as it seemed desirable to make this arrangement in order to have some uniformity between them. The individuality of our association has been fully maintained; we have our officers, including a secretary and treasurer who is separate and distinct from the secretary of the American association.

One of the most difficult features with which your committee had to contend in this reorganization was the question of taking care of the individual members, who were termed "active members" in the old association. This question was finally determined by having the active members of the old association become associate members of the American Street and Interurban Railway Association and ally themselves with this, the engineering branch. This is a fortunate method of taking care of the individuals, as it gives them all the advantages of membership in the Engineering association, as well as membership in the American association.

At this point, I desire to extend my thanks to the members of the executive committee of this association for their co-operation and able assistance in this matter. It required a great amount of work to arrange and rearrange a Constitution and By-Laws, which would conform to the plan as outlined last year by the American association, and it was through the valuable assistance of the various members of this committee that we were able to present an acceptable Constitution and By-Laws.

While speaking on this question of reorganization, I desire to thank Mr. Ely, the president of the American association, and the various gentlemen allied with him as representing that body, as well as the presidents of the other allied associations, the members of the executive committee, for the kind consideration which they have given our association in this matter, and I can assure you, gentlemen, that, with this kindly feeling existing, the success of our association under the reorganization is assured.

Your committee, in considering the work for this year's convention, was confronted with the fact that there is a large amount of work to be accomplished by this association, and we had to confine ourselves to subjects which we considered of greatest importance for presentation at this meeting. The subjects selected will speak for themselves. Continuous work has been accomplished through standing committees, either carried over from previous years or recently appointed, such as the committee on "Standardization." This is a desirable method of carrying on the work, as the changes which are taking place in the railway world require constant study in order to keep abreast of the times. Although it is not my purpose, at this time, to outline definitely the work for the future there is one point which appeals strongly to us all as being worthy of consideration and that is the question of the construction of our buildings, particularly from the fire standpoint. Within the past few years we have had several examples of what may be done in the line of fire-proof building in connection with conflagrations, and I speak from experience when I say that it is possible to build in such a way as to withstand the attacks of a conflagration. At present each of us is working out his plans as they are needed, and, if some combined steps could be taken in this direction it would be of great benefit for the future. This is a matter that the "Insurance" committee is to report upon, but the details of construction belong to our engineering association. Take, for example, the new scheme of fire protection in car houses by the use of aisle sprinklers. Up to date, there have been a number of car houses equipped with these systems. Are we sure that the present method of installation is the best, or is it possible to improve it? This is a subject into which the association can well afford to look.

The "Standardization" committee, which was appointed during the past year, has been doing a vast amount of work. It was not the intention of this committee to solve this vast problem in one jump, but to attack the same in a systematic manner, in order to lay the foundation, or basis, on which to work, and, although the committee has no definite conclusions to submit for the approval of the association at this meeting, the work which it has laid out has been very thorough, and an examination of the data sheets that were sent out by the committee will show the details they have undertaken.

The committee has met with liberal response from the various roads, and it is hoped, in the future, the response will be even greater. At the present time it has under consideration the brake shoe, wheel tread, flange, journal, journal box and rail section. In the work of standardization your committee has endeavored, as far as possible, to confer with the manufacturers interested in the various parts and it has met with very encouraging response in every direction in which it has reached out. It is the hope of the committee that among the results to be accomplished in the future will be the standardization of certain parts of the electrical equipments upon motors of the same horsepower, such parts as the commutators, brush holders and brushes, gears, pinions and axle bearings. This result can only be accomplished by the full co-operation of the various electrical companies interested, but I feel sure that when the committee is ready to take up this question, the companies will stand ready to assist it in every way possible way.

Before leaving this subject, however, I want to extend my thanks to the committee and particularly to its chairman, Mr. H. Wallerstedt, for the able and earnest work that has been done up to the present time, and, although the work is in its infancy, I am confident of its success.

During the month of March, 1906, one of the members of the executive committee, who was elected at the Philadelphia convention, Mr. W. Boardman Reed, resigned his position on that committee, owing to the fact that he had left the services of the New York City Railway Company to enter into private business. It was with great regret that Mr. Reed's resignation had to be accepted, as he had been of the greatest assistance as a member of the committee. Mr. W. T. Dougan, of the New York City Railway Company, was appointed in his place by the executive committee, in accordance with the by-laws.

Our association has for its object the bringing together of those engaged in street and interurban railway engineering. for the interchange of ideas; to acquire and distribute information, and to promote uniformity of practice. We bring together under the head of "Engineering," construction and operating engineers of all branches in the railway work and upon us as engineers rests a great duty. We do not necessarily come in direct contact with the public, rather occupying the position of the "men behind the guns," but the engineer's duty to the traveling public is of the greatest importance. Upon him rests the question of reliability of service. If there is trouble in the power house, in the overhead lines and cables, or on the cars, it is "up to the engineer". It is his duty to reduce to a minimum the interruptions due to defects. Nothing is more aggravating to the traveling public than interruptions to the service. Explanations are not what they want, but continuity of service. In the period in which we are operating we are facing questions of great moment as affecting the relations of our companies to the traveling public, and it may be the aim of this association to so direct its work, that it will be of the greatest assistance in mastering these questions; and may we as engineers so fulfill our duties to our respective companies, and through them to the traveling public, as to give that reliable service which is desired, and thus render the most effective service possible in connection with these problems.

In conclusion, let me say that the hasty glance we have had this morning of the exhibits, which have been prepared by the Manufacturers' association, is certainly an indication that we can spend considerable time in studying them to our profit. Without doubt this is the finest lot of exhibits ever gotten together for one of our conventions, and the Manufacturers' association has our congratulations.

I wish to extend my thanks and appreciation to the executive committee and other members of the association for their hearty co-operation during the past year. The assistance given has been of great value to the association and to me in carrying on the work.

The Southwest Missouri Railroad Company is represented by Superintendent of Transportation S. W. Gunsalus, of Webb City, Mo.

Mr. Joseph A. McGowan, auditor of the Indianapolis Traction & Terminal Company, was one of the arrivals at the Southern on Monday.

Mr. C. E. Learned, superintendent of inspection of the Boston Elevated Railway Company, was one of the late arrivals Monday at the Southern.

Dr. and Mrs. J. M. Griffin of Detroit, who are attending the convention, are stopping at the Chittenden. Dr. Griffin is president of the Wheel Truing Brakeshoe Company.

Mr. Ernest Gonzenbach, secretary and manager of the Sheboygan Light, Power & Railway Company, Sheboygan, Wis., was one of the railway men to arrive at the convention halls today.

"A Little Guide to the City of the Great Discoverer" is the title of an eight page folder which is being distributed. The "Little Guide" contains an excellent map of Columbus and its tributary country, showing the electric railways in red lines and the steam roads in black. The folder also has a list of hotels, theaters and principal buildings.

THE CLAIM AGENTS' ASSOCIATION.

The third annual meeting of the American Association of Street and Interurban Railway Claim Agents met at 2 o'clock, p. m. ,on Monday, October 15, 1906, in the Administration Building, with President S. L. Rhoades, of Philadelphia, Pa., in the chair, and Mr. B. B. Davis, of Columbus, as secretary.

In calling the Association to order the President called upon Mr. Davis of the Convention City, who welcomed the Association to this city.

Mr. B. B. Davis, claim agent of the Columbus Railway & Light Company, welcomed the association in the following brief address:

It is for me, as the representative of the Columbus Railway & Light Company in this association, to make the address of welcome. I wish that Professor Swenson and Mr. Rhoades had chosen somebody with more oratorical ability than myself for this part of the programme, so if I blunder or stumble, you will pardon me, for I am more inclined towards results than speech making.

I trust that your sojourn in our city will be one round ot pleasure, and that you will carry back to your respective homes pleasant thoughts of the city of Columbus, and the treatment you received while in our midst. Personally, I am in love with the Capital City, for when I came here a perfect stranger in 1895 it was to be for about ten days, and I have been here nearly twelve years. I have seen the city grow in population and also have seen this street railway system expand from $500,000 gross, per year, to over a million and a half, gross, per year. That is making progress.

I trust, gentlemen, that your relations with your management and operating department have been as pleasant as mine have been with those departments of this system—in nearly twelve years, not an unkind word. But it does not take hard work to bring that result, and it can be found in the following rules: Work for your company at all times; study its interest; feel that when you are making a settlement that the money to be paid is coming out of your own pocket; be pleasant to all employes, from the man who works in the track gang up to the president, and success will crown your efforts and make your work more pleasant and full of good results.

But I am wandering a little from the subject, which is one of welcome. So, for the Columbus Railway & Light Company, I bid you all welcome to the capital city of the Buckeye State and trust that none of you will feel any regret for having attended this convention.

President Rhoades then called upon Mr. John I. Beggs, vice-president of the American Street and Interurban Railway Association, who claimed a great interest in this very important part of the operation and administration of railways and added that claim agents were not made a part of the organization of the street railway from choice, but rather from necessity—a very expensive necessity. He emphasized the fact that the great requisite of a claim department is promptitude—not to wait until a convenient season, but the response must be prompt. As a general rule the amount paid out for claims in railway companies goes about hand in hand with the amount of taxes paid.

Every one connected with a claim department should carefully learn how to analyze the common law and the particular statutes of the various states in which his company is operating, to ascertain and determine liability.

His advice to all was upon any fair basis of settlement to get the claim off the books and get it off quick. If it is a fair claim for damages, the company should be willing to pay a fair and reasonable amount for it and pay it at once, before it gets into the hands of an attorney. It makes a better impression throughout the country and is far-reaching in its effect. It has been found highly profitable to the companies that pursue that particular policy.

The most difficult thing to impress upon the claim department is that it is more important to know the worst side of a case against the company than it is to know the best. A too favorable view gets into the hands of the counsel for the plaintiff and the counsel for the company is taken by surprise on an entirely different condition of affairs. It is highly important to impress upon those sent out to investigate accidents and claims, that they get all there is.

The policy pursued by Mr. Beggs is that all the investigation in the claim departments of the companies must come from the platform on the car. As an investigator is needed, a man that knows the conditions under which the car operates, knows the condition under which the accident might have occurred, in order that he may draw from his experience, because the motorman and conductor will not always tell it all.

In a city like Milwaukee, where 85 per cent of the population is foreign born, or of foreign born parentage, investigators are selected with reference to their knowledge of the various languages and of the people because they act differently. Three or four men investigate an accident as promptly as possible in order that it may be seen from three or four different standpoints. The result of that is a reduction of the accident fund. That is the result of being fair, and shows what can be done by that policy. The speaker believed this to be a record that is certainly not surpassed in this country and, he thought, seldom equalled. In the year 1904 notwithstanding the prejudice of juries and the inclination of courts to be swerved to some extent by public clamor not a single case was lost that came before a jury, nor were any damages allowed; and in the year 1905, only two.

President Rhoades expressed the claim agent's appreciation. I am quite sure that our appreciation of what Mr. Beggs had said, and thought every one should feel more confidence in himself, as it is not often that a great railway manager will admit that an accident man is an absolute necessity.

Hon. W. Caryl Ely, president of the American Street and Interurban Railway Association, by request, then addressed the association.

Mr. Ely apologized for being a little late, but said that the members had for some reason or other (perhaps from force of habit) so hedged themselves in and surrounded themselves by woven wire fences that it was impossible for him to get in until he had skirmished around the buildings for ten or fifteen minutes.

Mr. Ely then said that he had come to talk briefly about the organization, the work of the parent organization and the other affiliated organizations. They had done much in the past that makes for and ought to make for success. But success had not yet been achieved; and upon the way that this convention is managed and upon the manner in which it is conducted will, in the speaker's opinion, largely depend the earnest co-operation, throughout the country, of those who have to foot the bills and pay the expense, as to whether this reform movement, or reorganized sets of associations are worth what they cost. A big company, one of the largest companies, has now to pay $600 a year on account of these organizations in addition to the other expenses that are necessarily attendant, instead of a $25 fee that was paid heretofore. Many of the managing officers and executive officers of these corporations are from Missouri—"they want to be shown."

He congratulated the association upon the results which were achieved in such a very short time. The contribution about to be made to the proceedings of these conventions was, he said, well prepared and in every way worthy of the association and worthy of a great business and of a great organization. He believed that other affiliated associations will be created as time goes on, and that the importance of each of them, in the minds of the managers and executive boards, will finally be conceded.

Claim Agents were designated as the "rat hole" of the business. The money comes in through the cars, through the receivers, the officers and the car houses, and finally it comes up into the auditor's department and it is husbanded by the treasurer and the manager handles it and fingers it and then the claim agent comes along and slips the money away and at the end of the year it is realized that a tremendous amount has got away by that operation.

He believes if the people could be made to realize that the course of dealing is fair and it can be established in the minds of the people throughout the country, it will save millions of dollars to the street and interurban corporations.

He thought the same rules ought to prevail in the management of every department of a corporation, which prevail in the management of an honest man's business by an honest man, and that the great trouble with corporations has been that there has grown up in the minds of the people throughout the country the idea that they do not apply to the transaction of corporate business the same rules that the members of the corporation apply to the transaction of their own private business.

He believes there is absolutely nothing in the business, that is inherent in it, to make it unpopular. Street railway business ought not to be unpopular and does not deserve to be unpopular. The street railway people and the interurban railway people are absolutely performing a service that deserves the thanks of a grateful community and he believed that this sentiment which prevails against them at the present time will be diminished and ultimately pass away.

The rule of a man's life—a square man—an honest man, is that he will pay to his neighbor the things that are due to the neighbor, but he will never give up to his neighbor in an unjust controversy the things that his neighbor ought not to have and ought not to take away from him. He believed this rule to be right and that it ought to prevail in railway business.

Mr. Ely said that a justice of the Supreme Court of the State of New York once said to him: "Ely, why don't you settle a lot of those suits that are on the calendar?" He replied, "Judge, after we get through lunch, come down to my office and I will show you in twenty minutes why you would not settle one of those cases." He did go and looked over the cases. After he got through he said: "Well, it is certainly extraordinary that such a condition of things should prevail."

The speaker then declared his intention to leave the office which he had occupied for three years and bespoke for his successor the same loyal support and interest evidenced in the short time of this organization toward him.

President Rhoades said that judging from what the speakers had said they would begin to think that a claim agent does amount to something.

The next order of business was the reading of the president's address, which will be found elsewhere.

At the conclusion of the president's address the minutes of a meeting held in Philadelphia in September, 1905, were read and approved.

The report of the executive committee was also read and approved.

President Rhoades then stated that last year there seemed to be some doubt in the minds of some of the members of the association as to whether or not the parent organization would stint in any way or not agree to give the appropriation which might be asked for. He desired to say that he attended the meeting of the executive committee of the parent organization in New York and it was only necessary to say a dozen words and inform them how much was wanted, whereupon it was voted immediately. He felt perfectly safe in saying that there would be nothing asked for, within reason, by this association of the parent association, as it is at present organized, that would be refused.

The next order of business was the report of the secretary.

Secretary Davis made his report for the past year in detail; he stated that the work of the office had greatly increased especially with regard to the correspondence.

The report of Mr. Davis, as treasurer, showed receipts of $800 for the use of the association, and expenses for the year, $766.76. The association now has 201 members.

The president then announced that copies of the Question Box and the papers to be read to the association would be in the hands of the secretary ready for distribution tomorrow (Tuesday) morning, and that, instead of the Question Box being taken up and disposed of at the session prescribed by the printed programme it would come up for discussion and disposition Tuesday morning. He stated that many people have responded to the request to send in blank forms for the inspection and information of the various members and that if there is any particular form which any member of the association desired to procure, he could write to the particular claim agent furnishing that form and he would be glad to send a copy of it.

He also announced for Tuesday evening through the kindness of Mr. Davis a stereoptican exhibition at No. 5½ West Broad street, at the Engineers' Club. Mr. Silcox, who has charge of that work for the Philadelphia Rapid Transit Company will show a number of views, among which will be photographs of people taken in actual work although in their damage suits they had claimed under oath to have been entirely incapacitated from doing anything. It has been arranged for the exhibition to begin as near 7 o'clock as possible.

Mr. Samuel Dorsey, Denver, Colo., made the suggestion that the secretary be instructed to have a photographer take a picture of those present at this convention, sometime during the week. The suggestion was approved for Tuesday at noon.

The association then adjourned until Tuesday, October 16, 1906, at 10 o'clock a. m.

WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY.

The Westinghouse Electric & Manufacturing Company builds various types of electric locomotives and equipment for all classes of service. For elevated railways, tunnel operations and transportation over heavy grades or where a frequent, rapid service is desired, electrical operation has become recognized as especially advantageous. Some of the more notable railway installations equipped with Westinghouse apparatus include those of the New York New Haven & Hartford Railroad from the junction with the New York Central to Stamford, Conn.; the Grand Trunk Railway for the St. Clair tunnel; the Swedish State Railways; the Pennsylvania Railroad for its Manhattan tunnel; the Spokane & Inland Railway, and the Long Island Railroad.

For direct-current service the company manufactures several types of motors, and its single-phase motors are so constructed as to operate with thorough success from direct-current circuits. Where local conditions make the arrangement necessary it is possible to combine the two systems, running the cars, for example, within city limits over tracks previously equipped for 550 volts direct current, while the outside lines may be operated by alternating current with a higher potential on the trolley. Both the rheostatic and series parallel type of controllers are carried, for use either with or without connection to electric brakes. For high-tension trolley roads, operated at potentials up to 6,000 volts or more, a form of catenary line construction has been especially designed for use in conjunction with Westinghouse single-phase alternating-current railway equipment, and may be used with bracket or cross-span construction.

The system of multiple-unit control developed by the Westinghouse company employs an ingenious combination of electro-magnetic and pneumatic devices to produce a reliable and effective method of controlling from a single point a single car or train of cars, all or part of which are equipped with motors.

Among the other products of this company of interest to electric railway men may be included the Westinghouse rotary converter and airbrakes.

ADDRESS OF PRESIDENT RHOADES.

The Claim Agents' association was particularly favored by the executive committee of the American association when the latter selected Columbus as the convention city. Fortunately, our worthy secretary is a resident here, and, as I am reliably informed, is familiar with the ways and means to insure the *most exclusive* claim agent a profitable and enjoyable time. I am quite sure that none of us will fail to take advantage of the invitation extended in his very appropriate address of welcome.

It was early decided that this season's convention should be held in the Middle West and Columbus was selected only after several other cities had been considered. This city was selected because it offered the best accommodations for the majority interested. Incidentally, we as claim agents are afforded an opportunity to examine the methods and management of the accident department of this city's railway company which, I believe, is maintained at a very low percentage of the gross receipts.

Although this is the second annual convention of our association, it is the first since the reorganization; and I am pleased to say that we are progressing, and that the fear entertained by some of us, that in organization we might lose our identity or be restricted in our work, was without foundation; on the contrary, there has been perfect harmony and co-operation. The officials of the parent organization have promptly granted every reasonable request and have shown their desire to assist us wherever possible. We acknowledge our indebtedness to the executive officers of that association for their assistance in completing and perfecting our organization and particularly to Professor Swenson for his personal attention to many of the details. With his co-operation we were able to formulate and adopt a constitution and by-laws consistent with those of the other organizations and satisfactory to the executive committee who had the matter in charge. It has also been our opportunity and very great pleasure to assist the parent organization, by promptly answering all communications referred to us by its secretary, regarding claim departments, and these queries came not only from America but from Europe, Australia and the Philippines, thereby showing that we, as a Claim Agents' association, are being recognized wherever street railways are operated.

I venture to predict from the attendance here and from the number who have signified their intention to be present, that this will be a unique and successful convention. During the past year your executive committee, following the suggestion of Vice-President O'Connor, has organized and put into operation a Question Box, which has proved a success beyond our expectations. In the questions and answers before you there is contained valuable information applicable to claim departments of all street railways, whether large or small, urban or interurban.

We have also on exhibition, at the suggestion of Mr. Renaud of New Orleans, copies of the blank forms of reports, etc., used by various companies. By a close examination of these printed forms new ideas may be obtained, and I trust that at the proper time we will have a free discussion concerning their merits. While it seems impracticable that any standard set of forms could be universally adopted, I would suggest the advisability of appointing a committee to consider the matter, together with the question of keeping statistics. Of one thing I am convinced, that as the cost of the accident department increases our superior officers will require more definite and particular information concerning expenditures. We should therefor aim to be in a position to furnish an answer to such questions, and, if it is possible, to arrange a standard system of statistics and accounts which by comparison might become of universal interest and value.

Each year our street railway companies are compelled to meet a larger and more unscrupulous class of persons who prey upon their treasuries. This practice is reaching such proportions that something should be done to check it. While it is too broad a subject to be discussed here, I wish to suggest the advisability of appointing a committee to consider the problem and devise some practicable method of treating it. There are other organizations now considering the question, and while it may not ultimately be a matter for the Claim Agents' association to deal with, it seems that if we could suggest to the American association some plausible plan, it might be willing to consider the matter. While I am speaking on the subject of committees, it has occurred to me that if we had something like an "Employment" committee, it would be an advantage. For example, during the past year I have been asked a dozen times if I could suggest the name of an experienced and capable man to take charge of accident departments. If I were to give particular attention to this matter, would it not accrue to our benefit? A very capable agent may, for one of many reasons, lose or resign his position and be looking for another. I recall a half dozen instances where this has occurred through consolidations, changes of management, etc. If these facts were in the possession of such a committee, our association would be able not only to answer the question but supply the man, who being both experienced and competent, would strengthen the association.

It is with deep regret and a feeling of sincere sorrow that I announce the death of an active member of our association, Mr. Feeney of New Jersey. Mr. Feeney attended the convention last year and took an active part in the discussions. While I did not have the advantage of a long personal acquaintance with him, I know from authorized reports that we have sustained a deep loss.

The papers to be presented at this convention are particularly interesting and valuable, a credit to the association and to the speakers. The association invites a free discussion on both the papers and the Question Box, so that we will all derive interest and benefit therefrom.

In conclusion, I wish to thank the members of the executive committee and of the association for their loyalty and cooperation and I sincerely trust that to all fellow-workers present, the convention will prove to be a most successful one.

The semi-steel insert brakeshoe manufactured by the Spear & Miller Company, of Chicago, has met with high favor in electric as well as steam railroad service. The company will be pleased to furnish a trial test of either its composition or semi-steel shoes on any electric road, in order to prove the value of these devices.

* * *

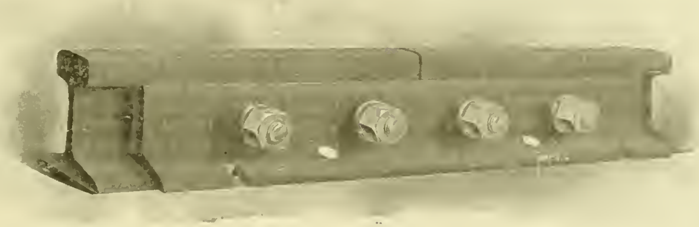
With the use of air brakes on electric cars came the necessity of air brake hose. One of the best known air brake hose in steam road use is that of the Peerless Rubber Company, of New York. In its exhibit it is shown not only hose, but rubber step treads and matting, rubber tile, sheet packing and the well-known Rainbow packing.

PLASTIC PLUG BONDS AT OAKLAND, CAL.

Nearly every electric railway finds after a few years of operation that its traffic greatly exceeds the original estimates. The number of cars operated has been increased; more dynamos and engines have been installed and more overhead feeders put up, but the expense of tearing up the pavement around the joint plates frequently prevents proper rebonding. Therefore the rail bond at first installed is left carrying several times its proper load, regardless of the fact that it has been strained and cracked by constant hammering of wheels and has been more or less corroded on its contact surfaces or burned from overload.

The bonding problem confronted the Oakland Traction Consolidated road at Oakland, Cal., after the earthquake last spring, as San Francisco's terrible disaster caused a large increase in the population of Oakland and surrounding towns, and trains running at 40 miles per hour were so frequent on the Key Route that it was impossible to do any track work during the day.

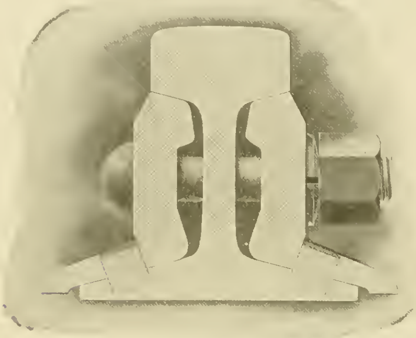
The problem was still further complicated by the fact that heavy guard rails on each side of the service rails prevented the easy removal of the joint plates and made it practically impossible to get them back into place if they were removed. The management decided at first to test bonds soldered to the head of the rail, which however were rapidly corroded by the acid formed by electrolytic decomposition of the soldering salts used in applying the bonds.


Joint with Plastic Plug Bond.

It was then decided to apply the plastic plug bonds manufactured by Harold P. Brown, 120 Liberty street, New York, and some account of the method of applying these bonds should be of interest. The advantages offered by this type were that there was no need to remove the angle plates, no need to use torches, and that in paved streets it was necessary to remove only enough pavement to expose a few inches of the rail. On the Oakland work, two large air brake compressers with their motors and reservoirs were mounted upon a car and operated four different sets of air drills. With this apparatus, nine men were able to bond 150 joints per night. Careful tests have shown that these bonds, when applied to both angle plates give the joint practically the same conductivity as the unbroken rail. The Eccles & Smith Company of San Francisco and Portland supplied the Chicago pneumatic drills used for this work, which was done under the supervision of Mr. J. Q. Brown, assistant manager and engineer of the railway company. After installing these bonds, and giving them a thorough test under severe conditions, further orders have been placed for other portions of the road.

The bond itself is simple. Between the first and the second bolt holes from the end of each rail, a hole from ⅝ inch to ⅞ inch in diameter is bored diagonally downward through the flange of the angle plate, into, but not through, the base of the rail. The hole is nearly at right angles to the plate flange and as near the vertical web as possible.

In doing a small amount of work, an ordinary ratchet drill and a J-shaped clamp passing under the base of the rail are the only tools necessary. When desired, a portable hand power drill can be supplied, with which from 40 to 60 joints per day cau be bonded by one mechanic and two helpers. The drill point is lubricated with a solution of Pearline and water instead of oil, so as to avoid the trouble which follows the use of an insulating fluid on a fresh metal contact surface. The hole is usually drilled to within ⅛ inch from the bottom of the rail base. The drill chips are removed with a permanent magnet, and the proper depth of the hole determined by a template or by a collar fastened to the drill stock. If desired, the plates may be drilled to a slightly smaller size before being distributed along the road for new work; this more than doubles the number of joints which can be bonded in a day. After the hole is drilled it is amalgamated by filling with water and rubbing with the end of a rod of the solid alloy. This instantly coats the steel with a layer of bright amalgam, which will not rust, nor will it permit the steel below it to rust.



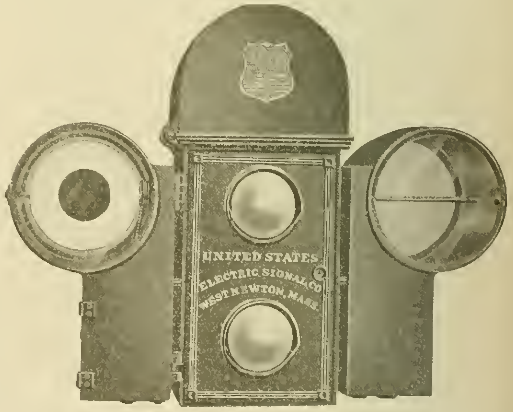
Section Through Plastic Plug Bond.

On bonds of large diameter, a spiral of flat amalgamated copper wire is placed into the hole so as to completely seal the crack between the meeting surfaces of the rail and angle plate as shown in the sectional view, but this is not necessary with small sizes. The hole is then partly filled with the "New Process" plastic alloy, which adheres closely to the amalgamated surfaces of the steel and forms a conducting path of very low resistance between the rail and the angle plate. Unlike the old type of plastic alloy, this material will not leak away even though a crack should be left between the rail base and the angle plate. The bond hole is closed by an amalgamated metal disc which is locked in place by a hammer blow on a blunt chisel, making a burr in the angle plate just above the top edge of the disc. To further insure the seal, a piece of flexible water-proof insulating material is fastened to the angle plate over the hole with a water-proof cement. After the bond is applied, the rail and angle plate may move on each other ¼ of an inch or more in any direction without breaking the contact through the plastic alloy. Even if the plastic alloy above the level of the top of the hole in the rail base should escape, there is still enough retained in the hole to maintain a direct contact, and this cannot be jarred out, since it is absolutely inelastic and adheres tightly to the steel and to the amalgamated copper spiral. The current passes from one rail through the plastic plug to the angle plate, then through the second plug to the next rail. A bond formed by a pair of ¾-inch plugs into each angle plate on a 70 lb. T-rail joint of A. S. C. E. section has practically the same conductivity as that of the unbroken rail. This bond is especially designed for rebonding work where the joint plates, bolts and nuts have firmly rusted into place. The bond is also very effective in new work, but the manufacturer states that to secure durability on new work National lock washers should be used under all the track nuts. In ordering the plastic plug rail bond it is necessary to send the maker a tracing or blue print of the end section of the rail and angle plate, from which the proper size and location is fixed and its conductivity and durability determined.

UNITED STATES BLOCK SIGNAL SYSTEM.

A block signal system should be simple, durable, effective and, for a single-track road, capable of protecting cars from both head and rear collisions. It should be of a character that will set and lock in a fixed position before the car passes the signal box and remain so, furnishing absolute protection without any further local means of operation or power until it is cleared by the car passing out of the block. The accompanying illustration is an exterior view of the United States signal box which, with its connecting circuits, is designed to fill the requirements as stated and is manufactured by the United States system does not depend on the continuity of

In this system a signal box and automatic trolley switch are placed at each end of the block. The signal box is located about 100 feet ahead of the trolley switch so that it may easily be seen by the motorman as his car passes under the troley switch, lighting a white or green signal in the box directly in front of him, and a red signal in series with it, in the box at the distant end of the block. A red signal always shows an approaching car, a green or white a receding one, and the block is clear only when the signal shown is green or white at the time the car passes the trolley switch. The United States Electric Signal Company, West Newton, Mass. a lamp circuit for its protection to cars. Should the lamps burn out after being lighted, the semaphores would still remain set, but in case no semaphores were used it would still be impossible to get a clear signal to enter the block in either direction on account of a relay being mechanically locked. Failure of power on the trolley wire only puts out the signal lights while the current is off the line.



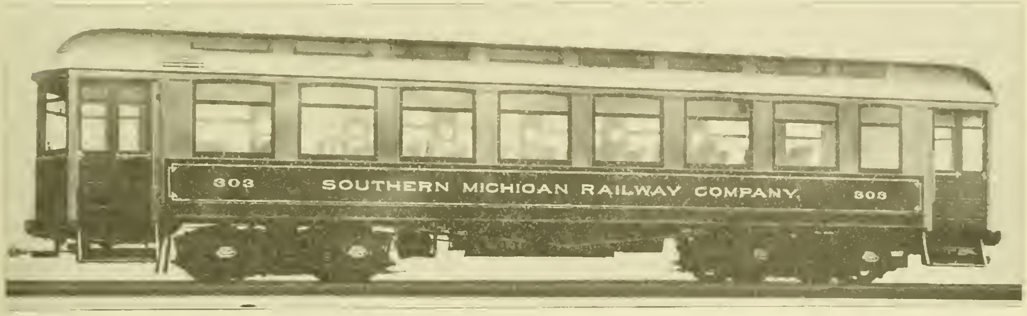
United States Electric Signal—Exterior View of Signal Box Showing White Semaphore Set.

Only one car should be permitted on a section of track between two turnouts at a time without a mutual understanding, or as a unit. By observing this rule it is possible to hold perfect control of traffic in both directions. These conditions are met in this new type of signal box and trolley switch made by the United States Electric Signal Company.

INTERURBAN CARS BUILT BY THE ST. LOUIS CAR COMPANY.

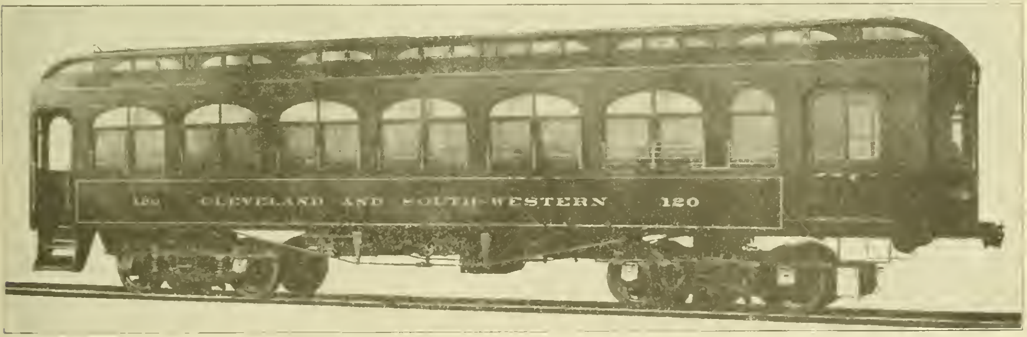
The South Bend & Southern Michigan Railway Company, of South Bend, Ind., recently placed in operation ten cars of the St. Louis Car Company's channel-bottom semi-convertible type.

These cars have a seating capacity for 52 passengers and are equipped with St. Louis Car Company's LX14 reversible seats. The inside finish is of mahogany of a very neat design. The general dimensions are: Length of body, 40 feet; length over all 52 feet; width between inside linings 7 feet 6 inches; width over all 8 feet 7 inches. The bodies are mounted on the St. Louis Car Company's No. 50 trucks.



New St. Louis Car for the Southern Michigan Railway.

The Cleveland & Southwestern Traction Company, of Cleveland, recently purchased from the company 10 combination passenger, smoking and baggage cars. The cars are fitted with 23 St. Louis Car Company's high back stationary seats, with head roll and grab handles, and are upholstered in green plush. The inside finish, except in the baggage compartment, is of mahogany, of a neat design. The ceilings are of Empire design. Neat bronze continuous parcel racks are used. The smoking compartment has four windows and the same interior finish as the regular passenger compartment. The baggage compartment which is in the front end of the car and divided from the motorman's compartment by a strong iron railing, is furnished with a sliding door on each side, and is finished in white oak.



New St. Louis Car for the Cleveland & Southwestern Traction Company.

The general dimensions of the car are 44 feet long over body and front bumpers, 51 feet over all, 8 feet 6 inches wide over sills, and 8 feet 7 inches wide over all. The bodies are mounted on St. Louis Car Company's No. 60 I trucks, which are machine fitted throughout, and especially adapted for high-speed interurban service.

LABOR AND MATERIAL ACCOUNTING WITH THE ADDING MACHINE.

We are indebted to Mr W. R. Gaither, auditor, South Chicago City Railway, for the following interesting suggestions for facilitating the work of an electric railway auditing department:

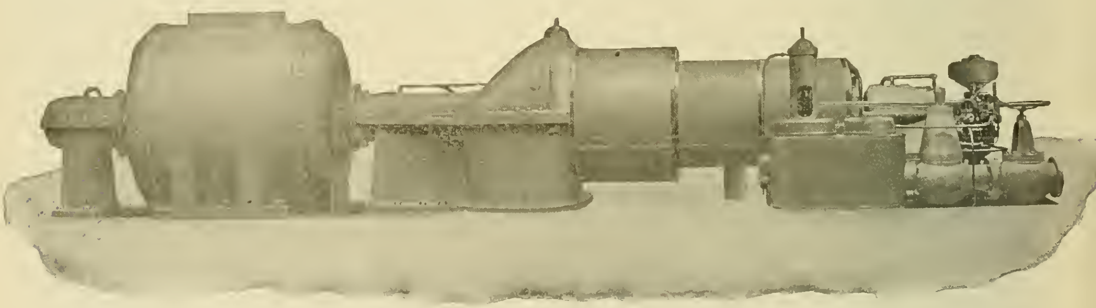
If it were possible, the accounting officers of an electric railway, as well as of other corporations, would be pleased (and relieved) to furnish monthly reports on the first day of each succeeding month. Every other day in the month his department is at work closing one month and carrying on the routine of the next. This is a task, the strain of which is not often realized by his superior officers, although they are usually anxious for the figures at the earliest possible moment. The value of the statements in shaping future policies furnishes a sound business reason for this anxiety on their part. Therefore, the accountant responsible is obviously interested in any plan that will lessen the time required for monthly closing of accounts, so far as this is under his control. The purpose of these suggestions is to cite some methods of using recording adding machines which are universally applicable to and will greatly facilitate this work.

One of these methods consists in having the orders on storekeepers for "supplies to be charged out as used," in the form of a rather stiff 3x5 inch card, a separate card being required for materials chargeable to different accounts. Then as each card is priced it is dropped behind a guide card for that account in a card index cabinet. Once a month or oftener, the cards for each account are footed on the machine. A list of these totals made up and footed, gives the monthly material credits to stores accounts and charges to the various operation and construction accounts. All handwork in making the distribution is saved. By exercising care many items not really stores accounts, may be put through by making one of these cards for it so that it goes into the general distribution. When the invoice is vouchered it is charged to the stores account which has previously been credited, as stated.

Another source of delay is the closing up of pay rolls. The writer has recently patented an attachment to the recording adding machine, which has for its object the posting of time and carrying along the daily additions of time or wages due each employe. This leaves nothing to be done at the end of a month or other period, except the extension of the trainmen's hours into money by the use of wage tables, and in the case of day labor, which can be posted directly in money values, nothing but footing up the roll. All who have added trainmen's time in hours and minutes across on a horizontal line will appreciate this improvement. There are many other desirable features obtained by using the adding machines, such as absolute accuracy, speed and legibility, which the writer will be pleased to explain, together with the system of keeping accounts. In fact the system is based on the substitution of machine for hand-posting of time. In making monthly entries of debit and credit items from distribution and cash books into the ledger and in taking off trial balances and material inventories, the adding machine is also of much service.

ELECTRIC RAILWAY SPECIALTIES OF THE ALLIS-CHALMERS COMPANY.

The Allis-Chalmers Company furnishes a complete line of street and interurban railway equipment, including prime movers and all electrical apparatus for power houses, substations, cars and lines. Among the most important as well as the most interesting of the company's products are the Allis-Chalmers steam turbines of which a model is being shown in the company's exhibit. The company some years ago recognized the fact that the steam turbine was destined to become a successful rival of the reciprocating engine and after a careful examination adopted the horizontal reaction type as the one which produced the best results. The Allis-Chalmers steam turbine is of the Parsons type which is the result of practical experience and systematic experiments extending over the period since 1884, when the first commercial Parsons turbine was produced. By arrangement with the inventor, Hon. Charles A. Parsons, C. B., the company derives the benefit of his long experience together with the rights to his latest improvements.



Allis-Chalmers Steam Turbine.

To meet the demand for a very powerful machine the company manufactures the heavy-duty Corliss engine of the type originally designed in 1890 by Mr. Edwin Reynolds, of which more than 5,000 are in daily use.

The company also manufactures the Bullock generators, both of the alternating and direct-current types. The Bullock alternators are of modern design and are made for all classes of service. Those for direct connection for steam engines are made in two types. The standard is type A 1, which is designed to attain the best possible results without special reference to flywheel effects of the rotor. The flywheel alternator, type AF, is built where the larger size is necessary because the rotor must necessarily be of larger diameter making the required flywheel effect. For direct-current operation the company manufactures three types of generators for either belt drive or direct connections. A full line of Bullock rotary converters of all sizes and capacities is also manufactured.

Another specialty, of interest to electric railway men, is the Allis-Chalmers oil-filled transformer, of both the self-cooled and water-cooled types. The self-cooled transformers are built in sizes up to 300 kilowatts. Above this size the external surface of the case is not sufficient to radiate the heat developed in the transformer core and coils unless the enclosing tank is made abnormally large. The water-cooled transformers are made in sizes of 100 kilowatts and upward. Water is circulated in coils of seamless copper or brass tubing immersed in oil and the heat is efficiently carried off.

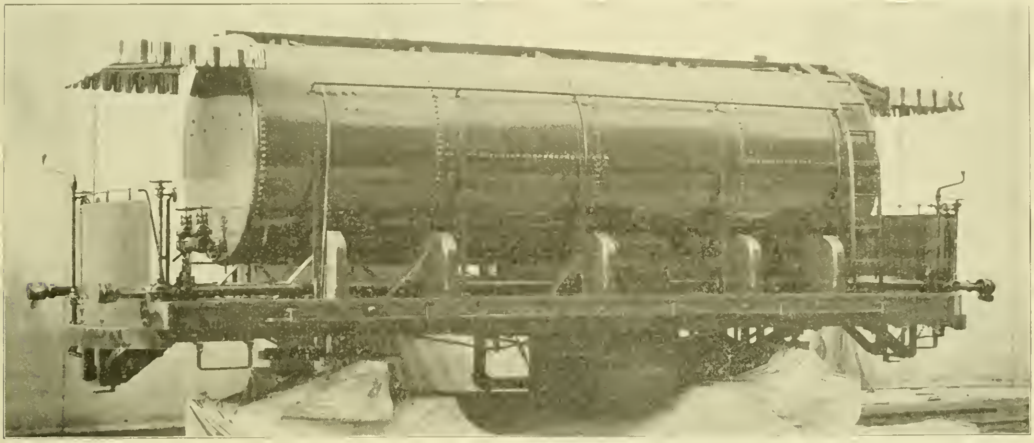
As announced in the daily and technical press all Christensen airbrakes and air-compressor patents recently passed under the exclusive control of this company, which has the sole right to the manufacture and sale of these devices. Adequate shop facilities have been provided in the plant near West Allis, Wis., and the company is now prepared to fill orders promptly for complete brake equipments as well as repair parts. It is stated that the average difference in the cost of operating an electric car furnished with hand brakes and one equipped with airbrakes, on roads where frequent stops are necessary, has been proven by actual tests with Christensen brakes to be between 10 and 15 per cent. The Christensen airbrake is said to be in use on fully 80 per cent of the electric railways that have adopted the airbrake system, and more than 16,000 equipments are now in successful operation in all parts of the world.

The company manufactures standard railway motors and controllers intended for both urban and interurban service on 500 to 650-volt direct-current circuits. The motors are thoroughly substantial and reliable in every respect and have been subjected to exhaustive tests in every-day service. For use with these motors the company has developed controllers for two and four-motor equipments. They are of the series-parallel type and are provided with an efficient magnetic blow-out.

The F. & B. Destination sign manufactured by the McLeer Engineering Company, of New York City, is a good sign and can be seen at a great distance, but it has not been seen at a booth in the convention halls to date. No doubt it will show itself soon.

DOUBLE-TRUCK SPRINKLING CAR FOR RHODE ISLAND COMPANY.

The illustration shows a large double-truck sprinkling car recently built for the Rhode Island Company by the J. G. Brill Company. Owing to the large amount of sprinkling the company is required to do the specifications called for a tank of 4100 gallons capacity, twenty feet long and six feet in diameter, necessitating double trucks. Two sprinklers like the one shown in the engraving were shipped to the Rhode Island Company and were fitted with the Brill centrifugal sprinkling device. The tank is tapped at one end near the bottom and fitted with a 3-inch tee and two gate valves for filling purposes. The manhole is located near the top of the tank and is flush with the outside of tank and fastened by a clamp. The slot in the sprinkling head was made ⅛-inch wider than usual and shields were placed under it to prevent the water from striking the street near the rail with great force. A roller is placed on the outside of each sill to support the hose, extending the full length of the tank. Another distinctive feature of this sprinkler is that instead of having the ordinary water gauge, a new float gauge is used, as experience has taught the builders of this sprinkler that water gauges are apt to break. The float gauge consists of a copper ball guided between rods suspended from the top to the bottom of the tank on the inside and the indicator slides over a rod on the outer end of the tank, supported by a chain which travels over two rollers. These rollers are encased in a casting designed for the purpose. There are awnings at each end of the car, an iron ladder which runs up the side of the tank on both sides and the usual pipe handrail. The dimensions are: Length of car over sills, 26 feet, 9 inches; width outside over sills, 7 feet, 2¼ inches; width over floor, 7 feet, 3¼ inches; size of side sills, 5¾ inches by 9¾ inches; side crossings measure, 3¾ by 8 inches, and end sills 4¾ by 8 inches. The sprinkler is fitted with specialties such as radial draw bar, angle iron bumper and alarm gongs, all of Brill manufacture.



Double-Truck Sprinkling Car for The Rhode Island Company.

The Standard Motor Truck Company has on exhibition three motor trucks which have many new and interesting features. It is showing an interurban truck which is designed to carry heavy single-phase motors in high-speed service; also a short wheel-base truck for city and suburban service, and a non-galloping single truck. New devices for automatically adjusting brakes and for checking the disagreeable side swing of cars, and rolling frictionless bolster hangers are also exhibited. The company is represented by A. W. Field, general sales agent, and W. G. Price, chief engineer.

THE GREEN TRAVELING LINK GRATE.

The Green traveling link grate, manufactured by the Green Engineering Company, of Chicago, may be seen in operation at the plant of the Columbus Railway & Light Company, where six machines, 7 feet 9 inches wide, are in operation. These are equipped with a 5-foot flat igniting arch under a B. & W. boiler set with front header 7 feet above the floor. It will be noted that the stoker consists of a cast-iron frame with cross rolls supporting a chain driven by sprockets on shafts at front and rear, which are operated by a train of cast steel spur gears. The steel gear train and ratchet mechanism are carried in a self-contained frame bolted to the front of the stoker. The sprockets are so designed as to shear any clinker that may get under the hubs of the drive links and automatically clean the engaging surfaces.

The side girders are removed from the fire and the front frames protected from exposure to the heat by removable ventilated cooling plates. The chain is kept tight by tension screws, which, projecting back of the chain, permit tightening without removal of the stoker from the furnace. In stokers of over 7 feet 6 inches in chain width there is a center tension device at the rear, and supporting brackets at the center of the front sprocket shaft. The chain itself consist of long narrow clips having slotted openings, through which the oval-shaped cross bars may pass. When the bars are turned and engage the binding links, these clips are locked in place. Any clip, however, may be removed by a simple turning of the oval bar to a vertical position, allowing the link to be lifted out and another one slipped in place, an operation that may be performed without stopping the stoker or interfering with the operation of the boiler.

The feed-regulating gate at the back of the hopper is designed throughout to be thoroughly ventilated and easily repaired. It is readily adjusted by a worm and sector on the side opposite to the drive mechanism. The gate itself is a standard I-beam located away from the heat of the fire and protected on the fire side by 4 inches of specially designed brick, any one of which can be removed and replaced while the stoker is under fire.

The patented flat igniting arch which is furnished with this stoker is of special interest, inasmuch as it can be adapted to any width of furnace and its flat construction causes uniform ignition and combustion the full width of the furnace, and entirely does away with any side thrusts on the furnace walls.

The uniformity of ignition and combustion allowed by this construction permit of the highest development of the principles of progressive combustion. This construction furthermore permits of the ready replacement of any individual tile in the arch without the necessity of entirely rebuilding elaborate centers for temporary support. In the modern installations freedom from smoke is obtained.

THE DEARBORN DRUG & CHEMICAL WORKS.

The Dearborn Drug & Chemical Works, founded in 1885, operates one of the most extensive analytical and testing laboratories that has ever been established for power-house chemistry. These laboratories are thoroughly equipped with apparatus for the work in hand, and a force of competent chemists devotes its entire attention to the subject of water chemistry. This company does not confine its methods to any one idea in the manufacture of its preparations, but careful analysis and study of each source of supply is made before undertaking its treatment, and preparations are compounded in such a manner as to make them especially adaptable and efficient for each individual water. The Dearborn laboratories also have a department devoted to the testing of oils, making coal determinations, etc., and are in a position to do most efficient work along this line.

The company is now erecting and has almost completed a new plant, at Thirty-fifth and Morgan streets, Chicago. The entire building, which comprises four stories and covers an area of 110 by 661 feet, will be utilized in the manufacture of Dearborn products, water treating preparations, lubricating oils and greases, and will be equipped with the best and most modern machinery and appliances for this purpose.

The general offices and laboratories of the Dearborn Company are located in the Postal Telegraph Building, Chicago, with general eastern offices at 229 Broadway, New York City, and branches in the following cities: Baltimore, Md., Birmingham, Ala., Boston, Mass., Buffalo, N. Y., Cincinnati, O., Cleveland, O., Denver, Colo., Detroit, Mich., Elpaso, Tex., Havana, Cuba, Honolulu, Hawaii, Indianapolis, Ind., Kansas City, Mo., Los Angeles Cal., Milwaukee, Wis., Peoria, Ill., Philadelphia, Pa., Pittsburg, Pa. St. Louis, Mo., St. Paul, Minn., Salt Lake City, Utah, San Francisco, Cal.

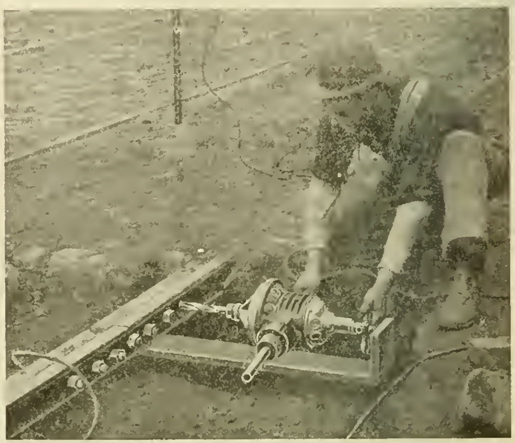
View of General Laboratory—Dearborn Drug & Chemical Works.

Conductor—"Did I get your fare?"

Observing Passenger—"I guess so, I didn't see you ring it up so it's a cinch the company won't get it."

PORTABLE ELECTRIC TOOLS FOR RAIL-BONDING.

A new portable electric drill to operate on street railway circuits has just been placed on the market by the Chicago Pneumatic Tool Company. Its 110 and 220-volt electric drills have been favorably known to the trade for the past two years or more and the mechanical features of these drills have been retained in the new drill. The accompanying cut shows a 550-volt drill in operation on rebonding work, drilling ⅞-inch holes in hard steel rails, and a fair idea of its size can be obtained by comparison with the man in the picture. This size of drill, as described by its builder, weighs 35 pounds, and will drill a ⅞-inch hole through an ordinary rail in less than two minutes. The electrical parts are built to operate at 500 to 650 volts without external resistance and a quick-break barrier-type switch many times the normal ampere rating of the drill is mounted directly on the housing. The insulation is of the highest type throughout and the drills are built to withstand the conditions of severe service in street railway construction and maintenance. Special precautions have been taken to prevent any danger of shock to the operator should any part of the windings become grounded, and within the hands of operators of average intelligence this danger has been eliminated.



Portable Electric Drill in Operation.

The company has also brought out a portable electric grinder wound for 500 to 650 volts for use on railway work. This grinder weighs about twenty pounds and drives an emery wheel, 8-inch diameter by 1¼ inch face, at a speed of 2,500 revolutions per minute. The usefulness of these tools will be obvious to all street railway men and will repay an investigation. They may be seen in operation at the company's exhibit, Space B, 3 to 5, Building 3.

Those familiar with the Thermit process will recall that the slag produced by the Thermit reaction was formerly collected in the box-like top of the sand and flour molds and remained in the form of a block on the head and tram of the rail, after the molds had been removed. In the rail welding as practiced by the Goldschmidt Thermit Company, the open top of the old style molds has been replaced by a cast iron slag box, the molds proper being now cut off slightly below the rail head. This makes them smaller, easier to handle and enables the men to place them in position in considerably less time. The slag collects in the slag box, which, when removed after the pour, draws the entire amount of slag with it, leaving the molds on the rail without interfering with traffic. The Thermit steel can in this way chill slowly and a stronger weld is then obtained. The principal advantages of this improvement are, saving in cost of mold, saving in actual time of welding and in allowing the work to be done under short headways without interrupting car schedules.

TIES, POLES AND POSTS.*

BY C. A. ALDERMAN, CHIEF ENGINEER OF THE CINCINNATI NORTHERN TRACTION COMPANY.

On account of the former abundance and cheapness of wood, together with the comparatively light wheel loads prevalent up to the beginning and during the early part of the last decade, the tie question was one which naturally solved itself. Owing to the growing scarcity and consequent increase in the price of timber, the question is one which is daily more forcibly presenting itself to those in charge of our railways to maintain them in such condition, as to carry economically and safely the heavy wheel loads imposed upon them by the advances of modern practice. At present the cost of ties, poles, and posts in the construction and maintenance of a street or interurban railroad is of such proportions, that the knowledge of what is best and most economical to use is of the utmost importance.

Ties constitute nearly one-third the total cost of the material for the construction of the modern interurban track, exclusive of ballast and roadbed. Their selection and use is moreover a matter of especial concern from the fact that their life is short and constant renewals must be made.

Poles are of somewhat less, although of very great importance, also in the make-up of the material account of the road.

Posts for the road built on a private right of way form quite an important item also.

Much attention has been given to the intelligent purchase and treatment of ties, poles, and posts by railway men, both steam and electric, during the past few years. Forests from which the tie, pole and post timber comes are rapidly disappearing; timber is becoming scarce and consequently very expensive. In bringing this subject to your attention, ties which are most important will be considered first, poles second, and posts last.

There are a great many different specifications in use by the various steam and electric railroads throughout the country. Steam roads as a usual thing buy their ties under more rigorous specifications than electric roads for two reasons. First, they have been in the business longer, are better organized, and have had years of experience in buying and inspecting. Second, a large number of the prominent steam railroad systems run through tie timber country, and for this reason, they can enforce more exacting specifications in the purchase of the ties. They can take the best for their own use, allowing the inferior ones to be shipped out to electric roads.

The specifications in use by the Cincinnati Northern Traction Company and the other interurban roads in Ohio and Indiana controlled by the same interests are as follows:

Quality of Timber.—All ties to be cut within fifteen months from the time of delivery from sound, straight, live and thrifty timber, free from loose or rotten knots, dry rot, wind shakes, or any other imperfections affecting the strength or durability of the timber. All ties to be strictly first-class.

Kind of Timber.—White oak, burr oak, chestnut oak, black locust, black walnut, and wild cherry.

Dimensions.—Six inches thick, 8 inches width of face, 8 feet long.

Seven inches thick, 8 inches width of face, 8½ feet long.

In hewn ties a variation in above dimensions of ¼ inch in thickness, ½ inch in width of face or 1 inch in length of ties will be allowed on a small percentage, that are otherwise fully up to standard. Pole ties having a width of face of 7 inches and otherwise up to standard will be accepted.

Full dimensions will be required in all sawed ties.

Workmanship.—Hewn ties must be stripped of bark, hewn smooth and clear of all splinters, straight, of uniform thickness, the two faces out of wind, and parallel throughout, and ends sawed off square. One inch of sap wood on two corners or two inches of sap wood on one corner will be allowed.

Prices.—Proposal will state prices for ties, based upon the above specifications, f. o. b., point of delivery, as follows:

For cross ties, 6x8 inches x 8 feet......—— each
For cross ties, 7x8 inches x 8 feet......—— each
For pole ties, 6x8 inches x 8 feet......—— each
For pole ties, 7x8 inches x 8½ feet......—— each

Under these specifications, it was found very difficult to obtain ties, so they were amended to allow a variation as follows:

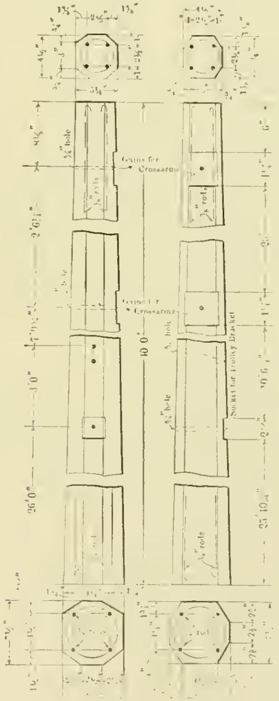
(To constitute not more than 10 per cent of order.)

First-class Ties.	Pole Ties.	Split Ties.	Sawed Ties.
Depth: Not less than	5¾ in.	5¾ in.	6 in.
Face: Not less than	6 in.	7 in.	6 in.
Face Swell: Not less than	8 in.	—	8 in.
Length:	7 ft. 10 in. to 8 ft. 2 in.	7 ft. 10 in. to 8 ft. 2 in.	8 ft.

(To constitute not more than 5 per cent of order.)

Second-class Ties.	Pole Ties.	Split Ties.	Sawed Ties.
Depth: Not less than	5½ in.	5½ in.	5½ in.
Face: Not less than	4½ in.	6 in.	6 in.
Length: Not less than	7 ft. 10 in.	7 ft. 10 in.	8 ft.

Ties purchased under these specifications are costing from 65 to 70 cents each delivered at convenient shipping points in Ohio and Indiana. Inspectors are stationed at the shipping points and all ties are accepted and classified before loading. Most of these ties come from Kentucky and some from southern Ohio.



The chemical treatment of ties with preservatives is becoming an important industry in the United States, as it has been in Europe for a great many years. Tie preservation of timber is today being scientifically investigated and practiced by nearly all of the leading steam railroad systems of this country. The various substances used in the treatment are as follows: Creosote, chloride of zinc, zinc and tannin, and zinc and creosote. The straight treatment with creosote or the dead oil of tar is acknowledged by all authorities on the subject to be the best, but is also the most expensive.

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* Read before the American Street and Interurban Railway Engineering Association, Columbus, October 15, 1906.

I am indebted to Mr. C. S. Walker, president of the Southern Creosoting Company, for the following notes on the preservation of timber:

"The theory of wood preservation by the application ot creosote is first to thoroughly sterilize the tie with steam in hermetically closed cylinders, thus destroying all germs of wood rotting fungi, and at the same time producing heat that will vaporize the fluids contained in the timber. The second operation is the subjection of the timber to a vacuum of about 25 inches, maintaining a temperature of about 100 degrees C. in the cylinders, at the same time. By this second process, all vapors are discharged through vacuum pumps, and in properly constructed plants any condensed liquid is collected in the drainage tank located beneath the cylinder. The material now thoroughly dessicated and heated is ready for the application of oil. Creosote heated to 150 degrees C. is admitted from measuring tanks without breaking the vacuum, and kept at that temperature by steam coils and cylinders. The wood, if time seasoned, or well steamed seasoned, will absorb from 10 per cent to 25 per cent of the required amount of oil before any pressure is applied. When the cylinders are full, the required number of pounds of oil are injected under pressure. The usual treatment is from 8 to 16 pounds per cubic foot for inland, and 16 to 22 pounds for seacoast work, allowance being made for the average absorption of oil by the timber. After the requisite amount of oil has been injected into the tie, the remainder is drained into underground tanks and the oil consumed is measured and checked against the theoretical amount demanded. The practical results of laboratory experiment can only be approximated. Exact measurement of the creosote cannot be expected. It is necessary that cylinder pumps, steam coils, and all other machinery of the wood treating plant be in perfect condition, so that the timber is thoroughly sterilized, and then a proper penetration of the creosote is secured. The timber being sterilized, all outer cells are covered or filled with an insoluble body, preventing access of air or water to the interior."

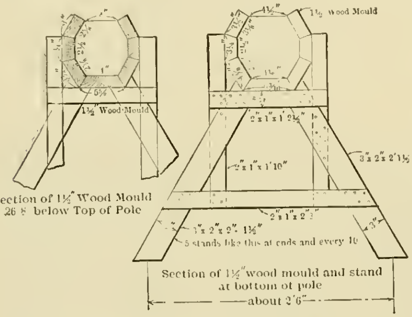
The cost of treating ties with the straight creosote process varies slightly, but will average about 30 cents per tie, whereas the zinc process will not be over 6 cents per tie.

With regard to trolley poles, some progress has ben made in preservation, but only to a very limited extent. Mr. Crump of the firm of Ford, Bacon & Davis makes a statement regarding creosoted trolley poles, which is to the effect, that they are in a much better conductor than the ordinary wood pole without treatment. He says, "In our regular work, we double insulate all our spans in the same manner that we would for steel pole construction." He further says, that the lighting company of Memphis, Tenn., does not use creosoted poles, as there is too much leakage of current at the potential used which is about 3,000 volts.

When the electric railway was in its infancy, the size of a trolley pole was about 25 feet in length, with a 6-inch top. Later on poles were used 30 feet in length, then 35 feet; and the top dimension was changed to 7 inches. The next step was to change the top dimension to 8 inches, and the latest and best practice is to use a pole 40 feet in length, with an 8-inch top. This is almost universal practice where the alternating current wires are to be carried on the same line of poles as the trolley.

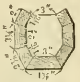
Poles have pretty generally been of cedar, although quite a number of juniper from the southern states have been used. Chestnut poles have also been tried, but their weight makes them quite objectionable to erect. Idaho cedar, so called, is coming into the market very rapidly just now as a trolley pole timber. The poles are very straight and present a fine appearance, but are not stocky or massive like Michigan cedar. The size at the butt is but very little larger than at the top. As to their lasting quality, I do not think they have been in use long enough as yet for us to give a reliable opinion.

The writer's experience with fence posts has been that a good grade of red cedar is about the best timber that can ordinarily be obtained. Black locust is said to be, and undoubtedly is, the very best timber that can be found for posts. Its scarcity, however, is such that it is impracticable to obtain in large enough quantities for anything but a short piece of road. A good cedar post 7 feet long, with top 4½ to 5 inches, on the other hand, is always quite readily obtained and will give very good service.

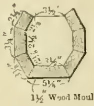


Section of 1½" Wood Mould 26'8" below Top of Pole

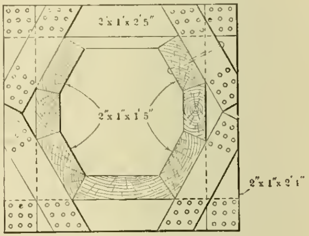
Section of 1½" wood mould and stand at bottom of pole



Section of 1½" Wood Mould at Top of Pole



Section of 1½" Wood Mould 13'1" below Top of Pole



Wood Framing every 5' lengths of 2"x1" variable to suit section of mould

Concrete for ties, poles, and posts, has been proposed and used to a limited extent by a few. My own idea is, that concrete is not very well adapted for railroad ties, but I see no reason why it should not be a success in trolley poles or fence posts. I submit herewith a drawing of a proposed reinforced concrete trolley pole, which I hope to see used to a very large extent within the next few years. The greatest objection to this concrete pole is its weight, but it can be set with a derrick or pole-setting device; and I believe will be brought within reasonable cost. Concrete posts have been used to quite an extent, and are no longer an experiment.

Steel cross ties of various shapes have been designed and used for railway track, the two forms used being, a modified I-beam and a channel. About a year ago, the Carnegie Steel Company got out a circular or catalogue illustrating a steel tie, which is an I-beam 5½ inches high, the top flange being 4½ inches wide, the bottom flange 8 inches wide, used in lengths of 8 feet 6 inches. The weight is 19.7 pounds per foot or 167.4 pounds per tie, exclusive of the fastenings which weigh about 6 pounds. The rail is secured to the tie with four ¾-inch bolts, by means of rolled steel clips fitting on the flange of the rail, and having a bevel the same as that of the flange and punched so that the shoulder of the clip gives accurate rail alignment. Proper insulation where automatic block signals are to be used is provided by the use of wooden shims between the rail and the tie, fiber bushings being used around the bolts and fiber washers under the nuts.

Old rails have been used for ties in London by the London United Tramway Company. The ties were spaced 9 feet apart, and consisted of 6-foot lengths of old tramway girder rails with a depth of 6 inches, and a flange of the same dimension. These rails were embedded in the concrete foundation, with the base flange uppermost, and were firmly fastened to each rail by means of two ⅞-inch bolts with beveled washers.

At the May, 1906, meeting of the American Railway Engineering and Maintenance of Way Association, Mr. W. C. Cushing, chief engineer of maintenance of way, Pennsylvania Lines West of Pittsburg, Southwest System, exhibited a series of very interesting tables upon the comparative value of cross ties of different materials. From these tables, he made the following deductions:

Deductions from Table 1.

(1) With white oak ties costing 70 cents delivered on the railroad, it is economical at the present time to buy inferior woods at a price not to exceed 50 cents, have them treated with zinc-chloride or zinc-tannin, lay them in the tracks without the use of tie-plates (except where it is necessary to use them on oak ties) and use a standard railroad spike. A life of 10 or 11 years has been found to be a maximum for such ties without the use of tie-plates and better fastenings, and if the life of 10 years is not attained, there will be that much loss to the company.

(2) When a white oak tie reaches a cost of 86 cents or 87 cents delivered on the railroad, it will be economical to use the zinc-creosote process, or straight creosote costing 30 cents, if the tie costs 46 cents delivered on the railroad and will last 16 years; or, it will be economical to use straight creosoting costing 85 cents for treatment if the tie can be made to last 30 years, which is French practice, before the oak tie reaches a cost of 80 cents delivered on the railroad. In both of these cases, it is assumed that tie-plates, wood screws and helical linings are used because ties cannot be made to last more than 10 or 12 years without the use of proper fastenings, since, otherwise, the tie will be destroyed by mechanical wear. It is necessary, therefore, to use improved fastenings when we expect to obtain a life of ties greater than 10 or 11 years. It will also be economical to use a steel tie costing $1.75 delivered if it will last 20 years.

(3) When the white oak tie reaches a cost of 90 cents delivered on the railroad, it will be economical to use either ties of inferior woods treated with zinc-tannin if a life of 14 years can be obtained, the improved fastenings being used; or a concrete tie costing $1.50 if it will last 20 years.

(4) When the price of white oak ties reaches $1.00 it will be economical to use a steel tie costing $2.50 if it will last 30 years, a concrete tie costing $2.25 if it will last 30 years or an inferior wood tie treated with zinc chloride if a life of 12 years can be obtained.

Deductions from Table 2.

(5) With ties of an inferior wood costing 46 cents delivered on the railroad we must obtain a life of from 18 to 20 years, whether treated with zinc chloride, zinc-tannin or zinc creosote, to make them as economical as white oak ties costing 70 cents. It is assumed of course that they must have the most approved fastenings in order to attain an age as great as that.

(6) With inferior wood costing 46 cents delivered on the railroad, and if the creosoting cost 30 cents, it will be necessary for us to obtain a life of 21 years in order to make them as economical as white oak ties costing 70 cents delivered.

(7) With inferior wood ties costing 46 cents delivered, and with the creosote treatment costing 85 cents as in French practice, it will be necessary for us to obtain a life of 36 years from the ties in order to make them as economical as white oak ties costing 70 cents delivered.

(8) With steel ties costing $1.75 each, delivered, it will be necessary for us to obtain a life of 28½ years in order to have them as economical as white oak ties costing 70 cents delivered. This price is a little less than the cost of the Buehrer steel ties in the tracks at Emsworth.

(9) With concrete ties costing $1.50 each delivered, it will be necessary for them to last 28 years before they will be as economical as the white oak ties costing 70 cents delivered.

(10) With steel ties costing $2.50 delivered and concrete ties costing $2.25 delivered, which are approximately the prices of the Seitz steel tie and the Buhrer concrete tie, in the tracks at Emsworth, it is necessary for them to last over 50 years in order to make them as economical as the white oak ties costing 70 cents delivered.

Deductions from Table 3.

(11) In order to make treated inferior woods as economical as white oak costing 70 cents delivered, when the treated ties are equipped with proper fastenings in order to make them last as long as has been found practicable by experience, we can only afford to pay for the ties delivered on the railroad, 10 cents each when treated with zinc chloride; 20 cents each when treated with zinc-tannin, or creosoted at 30 cents; 23 cents each when treated with zinc creosote and 29 cents each when creosoted in accordance with French practice.

(12) In order to make them as economical as white oak ties costing 70 cents delivered, we can only afford to pay $1.48 each for steel ties which last 20 years, and $1.79 each when lasting 30 years.

(13) In order to make them as economical as white oak ties costing 70 cents delivered, we can only afford to pay as first cost of concrete ties delivered, $1.15 each, if they last 20 years, and $1.57 each if they last 30 years.

(14) We know nothing about the life of concrete ties, and it is at least very desirable to experiment with them for yard and side tracks even though we do not use them in the main tracks, because they might lie undisturbed in yard tracks for many more years than they would in main tracks.

(15) When white oak ties are costing 70 cents delivered (about present prices), we can afford to buy inferior oak and other hard woods at 45 cents to 50 cents (present prices), and have them treated with the zinc-tannin or zinc-chloride processes, and only use the common spike fastenings.

The writer's only experience in the use of steel ties was in the construction of the Central Market Street Railway, Columbus, where there was used a steel channel furnished by the Lorain Steel Company, in laying the tracks across the Fourth street viaduct. These ties rested on a concrete base, and no trouble has been experienced to my knowledge in the maintenance of this piece of work.

Undoubtedly steel cross ties will be used to quite an extent as soon as timber advances in price, say 10 to 20 per cent. The rapid consumption of timber in this country is causing an increase in cost and a consequent reduction of the supply of timber suitable for ties, bridge timbers, etc.

The following figures will explain to a certain extent the scarcity of tie timber in the United States, and the reason why ties are becoming so expensive. There are now in the United States about 200,000 miles of railroad, and with second track, sidings, and yard tracks all included over 250,000 miles. This requires 630 million ties. The average life of a tie, untreated, is not over eight years. This means that 82 million ties are required annually for renewals alone, or the timber from half a million acres of forests.

A party of engineering students of the Ohio State University and Professor Magruder visited the convention exhibits yesterday.

REPORT OF THE COMMITTEE ON MAINTENANCE AND INSPECTION OF ELECTRICAL EQUIPMENT.

WILLIAM PESTELL, CHAIRMAN.

There are various systems and methods provided for the maintenance and inspection of electrical equipments throughout the country, all of which are designed with a view of meeting local conditions. One of these was treated at great length in an able paper at our St. Louis Convention by Mr. John Lindall, superintendent motive power and machinery, Boston Elevated Railway Company, Boston, Massachusetts.

The reliability of operation and economy in maintenance of electrical equipments are dependent primarily upon the selection of apparatus to meet the conditions of service, to some extent upon the methods of installation and particularly upon the system of maintenance and inspection. The engineering staff of the Interborough Rapid Transit Company has been selected with the greatest possible care and no expense or labor has been spared by them in the selection of the most efficient apparatus for this extremely severe service. This company is to be credited with taking the initiative with respect to reducing fire risks on electrically equipped cars, both in semi-fireproofing the wooden type through the use of composite asbestos and also in providing an all-steel type of car. This latter is original and a decided step in the advancement of the art.

The next in order as bearing upon the maintenance and inspection of electrical equipments is the method in which the various apparatus constituting the equipment is placed upon the cars. It is not unusual, even at this late date, to find railway companies disregarding the proper installation of equipments, although some of the companies, we are glad to say, have become alive to the importance of this feature of operation and are doing very creditable work.

The installation of equipments on the Interborough company's cars has been completely designed by its engineering staff and applied from working drawings, which is, we believe, an innovation in the method of performing such work, for usually this feature is left to the discretion of the shop foreman. As a result, a great deal of study was devoted to all the details of car equipment and the apparatus was applied in a most approved mechanical fashion, an absolute standard being maintained. This has proved economical, both in the cost of installation and of maintenance.

The methods employed in the maintenance and inspection of electrical equipment of this company were, in the beginning, similar in many respects to other systems of the kind, but have been altered from time to time for the purpose of introducing economies and increasing the reliability of the service, for the latter, as many of you are aware, is vitally important in the greatly congested districts of the metropolis. Formerly the car equipments were inspected on a 3½ to 4-day period, and the general repairs and overhauling were conducted within a period of from 12 to 14 months, without any regard in either case to the amount of work performed by individual cars.

The first improvement was accomplished by introducing a merit system between the shop forces, which reduced the cost of labor 31.7 per cent. on the Manhattan division and 29 per cent. on the Subway division, and also had a material effect upon improving the reliability of service. This system provides for an itemized comparison of the cost of labor and material between the five inspection shops each month, together with a bulletin showing the number and character of delays to service, from all of which the ability of the various foremen and inspection forces is determined. The object of this is to constantly maintain an efficient inspection force, which is, as all of you are aware, rather difficult, but the company states that this scheme has been unusually successful. The most competent foremen receive an increase in salary and the incompetents are either reduced in rank or dismissed from the service of the company.

The greatest publicity is given to these monthly recapitulations, so that all the officers of the company and minor foremen of the department are informed as to the relative merits or demerits of each inspection shop force, and it has thus been found that the old-fashioned methods in vogue of foremen taking it easy after appointment quickly disappear, and instead, the foremen are "on the job" constantly, so to speak. It is found also that they are unusually well posted on the expenditures of their department, which is rather unusual, and also that they are greatly interested in the reliability of the train service.

As a further step in maintaining an efficient inspection organization, a simple system was devised which provides for recording the name of each employe responsible for each item of work, thus impressing him with his share of responsibility and enabling the foreman to maintain a constant check on his men.

There is not much to be said of the old method of general repairs, except that accurate monthly records are kept, showing comparisons between similar classes of work performed on various cars, which enable the foremen to appreciate the value of expenditures for both labor and material and to avoid exceeding predetermined amounts.

The improvements since introduced were the placing of both the inspection and overhauling of equipments on a mileage or measurable basis, which, so far, has given very gratifying results. The accompanying table shows that the old method was, as stated, to inspect the cars every 3½ or 4 days, which, upon investigation, it was found gave an average of 450 miles per car. Through a series of experiments it was found that this mileage could be increased to 1000 miles without affecting the reliability of service, which reduced the volume of inspection work more than 50 per cent. and the amount of expenditure 21.5 per cent. on the Manhattan division and 31.9 per cent. on the Subway division.

The average mileage of general repair cars in service during a period of from 12 to 14 months under the old system was found to be 53,000 miles, the maximum 90,000 miles and the minimum 35,000 miles, from which it was decided to adopt an average of 65,000 miles between general repairs, as an experiment, thus making a reduction of 18 per cent in the expenditure for this purpose.

To reduce the maximum and increase the minimum mileage of general repair cars and thus equalize the length of time in service between general repairs, a system was provided for readjusting the cars on the train schedule each month.

The inspection mileage of car equipments is kept without additional expenditure by the train clerks of the transportation department and the general repair mileage is obtained from the mileage department.

The items of oiling motors, journals, compressors, etc., together with the wear of carbons, brake-shoes and other parts, are based on mileage comparisons, and it has been found, for instance, that the former methods of oiling journals and motor axle bearings each month at from 3000 to 4000 miles could be extended to 10,000 miles with satisfactory results.

There is maintained at all times a complete record of failures of all apparatus, and if it is found that any failure reaches an abnormal state, such failures are capitalized, and the necessary expenditures made for corrections in design or the purchase of new apparatus, which is not only a step in the direction of maintaining the most efficient service, but has also proven the most economical method.

In addition to these alterations, the Interborough company is at present experimenting with a piece-work system, for the purpose of providing a means of increasing the employes' wages, thus obtaining a better class of men and also to effect further economics. So far this has proven very satisfactory, for the amounts paid the employes affected have increased an average of 10 per cent, while the cost of the work has been reduced 26 per cent.

Summary of Inspection Work.

	Mileage System. Daily Average Cars inspected.	3½ Day System.	Reduction in Volume of Work.
Motor Cars, Manhattan....	121	232	47.8%
Trailer Cars, Manhattan...	47	135	65.2%
Motor Cars, Subway	53	110	51.8%
Trailer Cars, Subway......	29	82	64.6%
	Average Mileage Between Inspections.		Increase in Mileage.
Motor Cars, Manhattan....	967.57	484.47	97.6%
Trailer Cars, Manhattan...	1,422.44	450.14	216.0%
Motor Cars, Subway.......	1,014.14	419.04	142.0%
Trailer Cars, Subway......	1,459.30	380.67	282.3%
	Average Days Out Between Inspections.		Increase of Time in Service.
Motor Cars, Manhattan....	6.99	3.5	99.7%
Trailer Cars, Manhattan...	11.06	3.5	216.0%
Motor Cars, Subway......	7.26	3.0	142.0%
Trailer Cars, Subway......	11.50	3.0	283.0%
	Average Maximum Days Between Inspections.		Increase of Time in Service.
Motor Car, Manhattan.....	15.17	8.0	89.6%
Trailer Car, Manhattan....	19.00	8.0	137.5%
Motor Car, Subway........	12.38	5.0	147.6%
Trailer Car, Subway.......	15.83	5.0	216.6%

CROCKER-WHEELER APPARATUS FOR THE CONNEAUT & ERIE TRACTION COMPANY.

The main power station of the Conneaut & Erie Traction Company is at Elk Creek, about 17 miles from Erie, Pa., and 14 miles from Conneaut, O. The electrical apparatus in this station which has been doing good service for the past three years was supplied by the Crocker-Wheeler Company.

The main units consist of Pennsylvania Iron Works cross-compound engines direct connected to 14-pole, 400-kilowatt, 560-volt compound-wound railway-type generators. There are two such sets, but as the average maximum load is only 450 amperes it is usually necessary to run but one generating unit. Both machines, however, have a total capacity without overload of about 1,500 amperes. The generators have cast-iron internally-flanged magnet frames in which the mild steel poles are cast-welded, and iron-clad armatures consisting of toothed cores of laminated mild steel. The windings are secured in the slots by wooden wedges, fitting in notches near the tips of the teeth. To improve the heating radiating qualities of the field coils they are divided into three sections, individually wrapped, taped and insulated and separated from one another by small wooden wedges.

Another characteristic feature is the parallel movement type brush-holder. On each one four sets of copper leaves carries the current and controls the movement of the brush from or toward the commutator, always maintaining the same angle with its surface. This causes the brushes to wear away evenly and as they become shorter allows them to be extended and clamped in a new brush without altering the surface of contract. To regulate the brush pressure there is a helical spring, which, since it carries no current, is less inclined to heat and vary its tension. To compensate for inequalities among the magnetic circuits the brush-holder arms may be shifted independently, and to secure the position of sparkless commutation when the various circuits are in equalibrium, the entire rocker ring may be revolved by the hand wheel.

The switchboard includes seven marble panels for regulating and distributing the output of the generating and auxiliary units. One of the panels controls a Crocker-Wheeler No. 150 form-D booster designed to run about 600 revolutions per minute. The motor of this set is shunt wound for about 575 volts and the generator is series-wound for 175 volts with a full-load capacity of about 300 amperes. For feeding long direct-current lines the voltage of this generator is added to the normal voltage of the main generator. A four-blade automatic Crocker-Wheeler starter is included in the switchboard apparatus mounted on the booster panels.

IN THE EXHIBITION HALLS

The National Lock Washer Company, of Newark, N. J., has a very attractive exhibit in Building 1, Section B, space 29, where it has operating on full size car windows, its car curtains equipped with the National cam curtain fixture and the National balance curtain fixture with protected groove and windows equipped with the National sash lock and sash balance. There is also a full line of samples of the National lock washer and other patterns of nut locks for track and car work. The curtain and window fixtures of this company are being used on many large electric and steam railways, in all parts of the country, these devices being very simple in construction and very effective in operation. The National lock washer has been in service for many years, and the company states that it is now used on over 80 per cent of the electric railways in this country, Canada and Mexico. This company has been established over 20 years, and having been meeting the demands of the street railways for so long, is particularly well equipped to furnish electric railways with the very best devices of their kind.

* * *

The Security Register & Manufacturing Company, of New York, has an exhibit which should be of interest to all street railway managers, operating offices and auditors, as the company claims many superior advantages for its recording fare registers of both single and double types. The exhibit is in charge of Mr. Giles S. Allison, president of the company, and Mr. Daniel J. Fitch, manager of the New York office.

* * *

The American Railway Supply Company, of New York City, has installed a very complete exhibit of its metal badges for electric railway conductors and motormen. The display is very neatly arranged in a cabinet which sets at the front of the booth where it may be seen by everyone entering by the main entrance to the exhibition halls. The booth is in charge of Walter Chur.

* * *

The R. D. Nuttall Company, of Pittsburg, Pa., calls it to mind that the sleet season is near at hand. The company's line of specialties includes sleet-removing appliances of both wheel and scraper types in standard and high-speed sizes. The company is also showing two types of ball-bearing trolley bases, and several types of motor gears and pinions. The large sample board in the exhibit permits a ready inspection of a complete line of "Union" standard parts, wheels and repair parts, including the new Form 21 of wheels and harps.

* * *

The Dayton Manufacturing Company, of Dayton, O., has on exhibition an elaborate display of interior car furnishings and finishings, such as basket racks, ceiling clusters, door locks and other brass trimmings. The clusters are all wired up and when lighted present a very attractive appearance. The exhibit also includes a display of many different styles of arc-lights and a large number of dash lights such as are used by various street car companies and elevated railroads throughout the United States. Many of these headlights are wired up and can be seen in actual operation. Another new product shown is the Linstrom brake handle which has been particularly designed for use on traction cars, to be used as an auxiliary brake in connection with the usual airbrake equipment. Normally the brake handle is turned back out of the way against the side of the vestibule, but in case of emergency it can quickly be placed in service.

* * *

The Russell Car and Snow-Plow Company, Ridgway, Pa., has recently added new equipment and increased its manufacturing facilities. This company builds plows in a variety of sizes for single or double track, with or without flangers and with or without wing elevators. The plows are substantially built to meet the conditions of the purchasers lines. They can be operated at high or low speed, but it is stated that they are most effective at speeds of 25 to 45 miles per hour, and will do good work through snow drifts 12 feet deep. In extreme cases as many as four locomotives have been used to drive a plow through heavy snow and ice to clean the tracks. The Russel features of construction assure that the plows will stick to the track.

This company has recently developed for use on electric lines a snow-plow which embodies many of the indispensable features of its steam road plow, and which it claims is greatly superior to any other equipment now manufactured for the purpose.

* * *

A very complete line of supplies for rolling stock and power house repairs is sold by Guilford S. Wood, 206 Great Northern Building, Chicago. Among the supplies more frequently used in electric railway operation and which this firm is especially well fitted to fill orders for, are the following: Hose for carrying steam, water or air for pneumatic tools, engine and pump packings of various kinds, gaskets, fire hose, nut locks, steel castings, linoleum and knob, corrugated, royal Napier and cocoa matting suited for aisle strips and vestibules.

* * *

The Trolley Supply Company, of Canton, O., manufacturer of the Knutson trolley retrievers, reports many orders from among the larger electric railway companies. This company's retriever is entirely automatic in its operation of lowering a disengaged trolley wheel and the makers feel free to guarantee its operation under severe service condition. Other products of this company are the Climax combination arc and incandescent headlight, the Climax plain headlight and a number of types of dash headlights. These various headlights are simply designed and will operate on pressure from 300 to 650 volts, using from 1½ to 3⅓ amperes. The Trolley Supply Company is exhibiting these and other of its products at the convention.

* * *

The W. T. Van Dorn Company, Chicago, Ill., is this year exhibiting at the conventions six late types of its couplers, together with some lately-designed draft rigging. It is stated that there are now more than 350 roads using the couplers manufactured by this company, some of the products having been in 10 years' continuous service on elevated roads with comparatively no expense for maintenance. The results with these products in so widely distributed service are very satisfactory.

* * *

The Curtain Supply Company, of Chicago, manufactures a complete line of curtain fixtures and has a very attractive booth where its representatives will be pleased to point out the merits of this company's products to all visitors. Among the interesting window fixtures found in this exhibit are new designs for semi-convertible and open-car window curtains.

* * *

Atha Steel Casting Company, of Newark, N. J., has on exhibition, Space No. 9, Section A, Building No. 3, samples of its Titan steel motor gears. These gears are made of Titan steel, which is so hard that it cannot be machined and yet so tough that test pieces can be bent through an angle of 180 degrees without showing fracture, and naturally may be expected to give much greater service than gears made of other materials. The company states that the Titan gears wear about five times as long as cut gears and show a very great saving wherever they are in use. The fact that the Interborough Rapid Transit Company, of New York City, is equipping the elevated and subway divisions with these gears is sufficient evidence as to the ability of the gears to stand the most severe conditions encountered on electric railways. In addition to the Interborough, the Public Service Corporation of New Jersey and the Rhode Island Company are equipping their cars with Titan steel gears and many of the large systems are making exhaustive tests of these gears.

The Atha Steel Casting Company, as railroad men well know, makes bolsters; a sample is on exhibition at the company's booth. The Atha Steel Casting Company is the successor to Benjamin Atha & Company, established 1864, the oldest steel founders in the United States. The company has recently rebuilt and enlarged the foundry and now has the largest individual foundry in the East. Louis A. Shepard, secretary of the company, is in charge of the exhibit at the conventions.

* * *

The private car of the Toledo Railway & Light Company, now on exhibition, is equipped with Nichols-Lintern sanders, Aikman pressure annunciators, and Tomlinson couplers, furnished by the Ohio Brass Company, of Mansfield, O. The Lima & Toledo Traction ompany's car and the Columbus Delaware & Marion Traction Company's cars, which are exhibited by the Cincinnati Car Company and the Niles Car Company, respectively, are also equipped with Nichols-Lintern air sanders. The Columbus London & Springfield is another road which uses these sanders and the Aikman pressure annuciators.

* * *

A positive necessity in an electric station or a power station of any character is a high-grade oil for lubricating purposes. A large percentage of the lubricating oil used in the country is manufactured in plants equipped with the Jones under-feed system of boiler firing. Within the past three years the Under-Feed Stoker Company, of America, has sold over 80 Jones stokers to the Standard Oil Company and its allied interests. This represents equipment for a total of 13,515 horsepower and is the result of nine different orders for equipping various plants.

* * *

Many delegates to the convention will doubtless be interested in seeing the Cheatham automatic electric switching device which was recently installed by the Columbus Railway & Light Company, at the corner of High and State streets, almost opposite the company's offices. This switching device is operated by the motorman on the car who simply turns off the power entirely when he wishes to set the switch for the straight track and turn on the power to the second or third notch on the controller when desiring to take the switch, thus throwing the switch either way according to his requirements and doing away entirely with the services of a switch-tender at important switching points. Mr. Samuel Bowman, St. Louis, Mo., is general agent for this time-saving device.

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The problem of headlights, switch, signal and semaphore light has become of as much importance to the electric roads as to the steam roads. One of the foremost in anticipating the demand in its extent and variety is the Dressel Railway Lamp Works, New York. It has recently increased its facilities for manufacturing as well as designing by greatly enlarging its works in New York City, and is prepared to furnish any of the present standards or make any particular design from drawings. One of its specialties shown in its convention exhibit is No. 80 electric dash headlight. This is a new design of malleable iron lamp that may be applied without cutting holes in the dash. A malleable iron ring is furnished for the inside of the dash to form a rigid base for the headlights. The lamp is fitted with an 8-inch semaphore lens, has a drop hinge door and a spring catch at the bottom. This device absolutely prevents the door swinging open. An 8-inch lens gives much greater penetration of light than a reflector. It is more economical than plain glass, because it is not so liable to break and the lamp itself is designed to avoid the known weaknesses of ordinary lamps.

Besides the No. 80, this concern makes other styles of dash lamps and electric and oil-burning headlights. The incandescent headlights used on the electric locomotives of the New York New Haven & Hartford and the New York Central are of its make.

Another of the Dressel specialties is the No. 100 signal marker lamp made of malleable iron and steel and fixed permanently to the roof of the car. These lamps are for use on interurban cars to indicate the route of the car. They are standard on the Interborough Rapid Transit Company's lines. The Dressel Railway Lamp Works has perfected a long burning fount for switch and semaphore lamps. It is drawn from one piece of steel heavily coated with tin to prevent rust and leakage. In service and competitive tests it has shown great economy in oil consumption and in intensity of light. Twenty-five ounces of oil supply the flame continuously for a week. These founts are fitted with hemispherical reflectors adapted for a one-lens semaphore lamp or two-day or four-way reflectors.

To any one interested the company will be pleased to send on application the catalogue on "No sweat" steel signal lamps.

* * *

The Chase-Shawmut Company, which last year installed its soldered rail bonds on the Rochester & Sodus Bay and Sea Breeze divisions of the Rochester Railway Company, has received another order for its bonds this year from the same company.

* * *

The Consolidated Car Heating Company is exhibiting new types of cross-seat heaters, both with and without junction boxes; panel heaters of the continuous type; heaters for house and office use and portable vestibule heaters. Heaters of the two latter types can be wired directly across the line voltage of a railway system. Heaters for steel cars having steel risers and also several types of truss-plank heaters are also shown as are the "Consolidated" standard type of quick-break knife switches for electric heaters, car lights, headlights and complete switchboards. The company is represented at the convention by Cornell S. Hawley, S. Butler Keys W. S. Hammond Jr. and F. W. Brownell.

* * *

The productions of the Standard Steel Works, Philadelphia, are, in the unassembled form, what appear in the exhibit of the Baldwin Locomotive Works as assembled. Wheels of cast iron with spokes, plate wheels of cast iron, rolled steel wheels, tires and axles contribute the basis of the exhibit. There is also shown a 33-inch cast iron plate wheel of M. C. B. section with a section cut out. Etchings illustrate the quality of the metal used in tires and wheels and an electrical truck for the Ocean Shore Railway Company shows the parts assembled.

* * *

A neatly designed booth in Building No. 4 is the convention headquarters of the Massachusetts Chemical Company, Walpole, Mass., manufacturers of insulating specialities, water-proof paints, cable and transformer waxes, rubber molded specialties, Armalac, M. C. No. 50 insulating compound, etc. These specialties from their nature are not calculated to make a specially attraction display, but the exhibiting company is well content with the service record of its product.

* * *

Some firm names become household words. It is safe to assume that every mechanical man at this convention were asked what is made by Baeder, Adamson & Company, would instantly answer, glue and sandpaper. This is the result of seventy and more years of perfection in manufacture, and also some advertising.

You could ask the kindergarten class in the mechanical world what "B. & W." means and it would answer in chorus, "Babcock & Wilcox."

* * *

The International Register Company has an exhibit in keeping with the name of the company. It shows a complete line of fare registers. The company recently received a contract from the Brooklyn Heights Railroad Company for 2,000 of its type R 7 single registers which so far as known is the largest single order ever placed for registers. The company also shows register fittings, conductors' badges and punches and cotton trolley cord and is able to number 28 traction companies each having gross receipts in excess of one million dollars, among its patrons during the past year.

* * *

The Chicago Pneumatic Tool Company has in operation an interesting exhibition of rail drilling in its space in Building No. 3. The electric drills and grinders for rail bonding which also form a part of the display are wound for line voltage. A complete line of pneumatic drills and hammers is also displayed.

* * *

The Ohmer Fare Register Company, of Dayton, O., is exhibiting its well-known line of Ohmer fare registers, including machines designed to meet the requirements of all classes of roads, registering from one up to a dozen or more classifications of fares separately, with printed records containing all information hitherto written out by conductors. A new feature added this year is the recording dial at the side of the register to record the day and the month.

* * *

The cars exhibited in Machinery Hall by the Jewett Car Company are examples of the high-grade work turned out at the company's factory at Newark, O. The exhibit consists of a new type of semi-convertible car, a car recently built for the Brooklyn Rapid Transit Company and a 60-foot combination passenger and smoking car built for the Winona Interurban Railway Company. Each of the cars is built after the most modern designs. The cars are furnished throughout so that they may be seen as they are to appear during operation. The company's representative, Mr. E. Besuden, who is in charge of the exhibit, has constructed a very comfortable booth near the display in which to receive and entertain visitors during the convention.

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The McGuire-Cummings Manufacturing Company, of Chicago, has one of the most interesting exhibits to be found in Machinery Hall. The cars exhibited comprise a Romunder single-truck semi-convertible car and a McGuire snow sweeper. Both of these cars are provided with all of the modern appliances recommended as essential for a high-grade and modern car. They are each finished after the typical designs adopted by the company. The exhibits are in charge of John J. Cummings, W. J. Cooke and F. J. Ryan.

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Maj. H. C. Evans who has been the New York representative of the Lorain Steel Company since its organization is stopping at the Southern.

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H. F. Vogel & Company, of St. Louis, Mo., dealers in general railway supplies are represented at the convention by the genial Nic LeGrand. The booth of the Security Register Company of New York, Section B, Space 6, Building 4, is his general headquarters.

* * *

Railway men who have had their schedules interrupted and overhead construction torn down by flying trolley poles will be much interested in the exhibit of the Earll trolley retriever, (Space 8, Section B, Building 3.) Here may be seen trolley retrievers working under actual service conditions. Retrievers in great numbers will be found here and Mr. Earll is ready to demonstrate that they will all do their work perfectly. One of these retrievers is mounted on a skeleton frame in a manner that shows the detailed operation of every part of the machine.

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A leather-bound volume devoted to the subject of brake-shoes is the souvenir of the Keystone Brake Shoe Company at its exhibit in Building No. 3.

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The C. H. Wheeler Manufacturing Company, Philadelphia, is not represented at the conventions by an exhibit. The company manufactures the Mullan suction valveless air pump which is claimed to maintain the highest vacuum in the condenser at all times. It is made in horizontal and vertical, single, duplex and triplex designs.

* * *

The Adams & Westlake Company, of Chicago, has its booth well filled with goods representing the supply carried in stock at its several stores. The leading exhibits shown are headlights, signal lamps, brake handles and car trimmings of many varieties.

The floor of the booth, in Building 4, occupied by this company is carpeted with matting and around the railings are numerous potted palms and ferns which add to general artistic effect of the arrangement of the goods on display. The representatives of the company who will have charge of the exhibits are W. J. Piersen, G. L. Walters and Charles D. Carson.

* * *

A most popular booth is that of the Buckeye Engine Company, where ladies in attendance are distributing the "Buckeye Special" roses to all badge holders. A large supply of real "Buckeyes" is kept in sight and free to all desiring one.

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Okonite is so well and favorably known that it scarcely requires representation by an exhibit at electric railway conventions. By many railway officials it is considered as standard for rubber insulation and its standing appears not to have suffered materially from the numerous arrivals in the field since its first introduction.

* * *

As an almost universal electric car equipment the world around, but little is shown in the exhibit halls at the convention of the multifarious forms street car advertising assumes. The opporunity to reach all classes brings a diversity of style, a multiplicity of ideas, a liberality of treatment to reach a catholicity of taste—the public. The fact that a public vehicle should become the almost invariable distributor of information with regard to breakfast foods, is food for reflection. So valuable has street car space become that large capital is invested in the business. Comparatively few men control it—One of these is Baron G. Collier, Flatiron Building, New York.

* * *

The Lord Electric Company of New York, has joined with the W. R. Garton Company, of Chicago, and the Albert & J. M. Anderson Company of Boston in a large exhibit booth in Building No. 3. Here will be found a full display of loose samples and several types of soldered rail bonds applied, together with special tools for making application. A complete line of lightning arresters for railway power transmission and lighting circuits up to and including those 66,000 volts capacity are displayed. Messrs. E. M. Hamlin, Geo. B. Crane and Geo. W. Smith are in attendance. The souvenir is a paper knife with a check protector combination.

* * *

As traffic on interurban lines increases the necessity of signal protection becomes an important one and aside from the factors of safety, automatic block signals are of great aid in symplifying the labor and increasing the efficiency of the operating department. At the exhibit of the United States Electric Signal Company a modern and efficient system of automatic block signals for electric railways is being demonstrated which is worthy of the attention of progressive officials.

* * *

When you get that tired feeling just drop around to the booth of the Hale & Kilburn Company, of Philadelphia, Section B, spaces 4-5, Building 4, and sit down in those comfortable seats. You may have your choice of upholstering—either canvas lined rattan, mohair, plush, leather or imitation thereof. The company's new all-steel seat including aisle-end arm rest cushion and back frames, is attracting much attention. The seat has been adopted by the New York Central for all cars on the electrified lines. A neat display of the separate parts of the pressed-steel seats shows a pressed-steel pedestal in different stages of the constructions. Messrs. A. E. Old, H. T. Biglow and S. A. Walker are the representatives in attendance.

* * *

In view of the fact that practically all cars now being built are vestibuled for the protection of motormen and conductors and many of the cars now in service are having vestibules added to their equipment, it would appear as though some of the new ideas in convenient and efficient arrangement of vestibule windows were deserving of greater attention. At the exhibit of J. P. Sjoberg & Company, in Building No. 3, is shown a patented sliding vestibule center sash which has a number of commendable features. Instead of dropping the sash frames into pockets the center sash is suspended by swivel sheaves from an angular track above and slides to one side, the track and rollers at the bottom running between guide strips and holding the window steady while permitting free movement, yet doing away with all danger of the glass becoming broken from dropping the sash roughly into a pocket. Consequently all interference with the headlight brake or controller is prevented and furthermore the center sash as well as the side sashes can be removed very readily for the summer, if desired.

* * *

Joseph T. Ryerson & Son occupy space 20 in the Agricultural Building. This exhibit consists of a working model of the Continental boiler, model an exact reproduction of the standard 150-horsepower steam generators, built on a basis of one inch to this part. The shell of the model is entirely of glass so that the circulation can be easily seen when this boiler is under steam. This model attracted considerable attention from the delegates as well as from the engineering students of Ohio State University who were taken to the Ryerson booth by Professor Magruder of that institution. In addition to this boiler model, simplex car and track jacks are exhibited and demonstrated as well as The Ryerson portable automatic key-seating machines for cutting key ways in axles, shafts, etc. The exhibit is in charge of Messrs. F. B. Slocum, A. P. Van Schaick and E. T. Hendee.

* * *

The practical operation of a device is always more satisfactory to the interested investigator than is an exposition of the idea in blue prints or the theoretical workings of models. On the Columbus Railway Company's line at the corner of High street opposite the Capitol may be seen the Cheatham electric switching device. Anyone desiring illustrated and descriptive catalogues will be supplied on addressing the general agent, Samuel Bowman, St. Louis, Mo.

* * *

Various and several have been the schemes of man to safeguard passengers when entering and leaving car platforms. The advantage of restraining the general impulse to jump is too obvious to admit of argument and the Wood's Safety car gate, made by the R. Bliss Manufacturing Company, of Pawtucket, R. I., is one device that came and stayed. It is easy to operate and reduces the time of stops.

* * *

One of the companies that is discommoded by the non-arrival of its display of goods is S. F. Bowser & Company, who are new exhibitors at the electric railway conventions. The goods of this company were shipped from Ft. Wayne, Ind., on the sixth of the month and have not since been heard from. Tracers have been sent out and it is hoped some news of shipment may be obtained in time to permit the goods to be placed on exhibition. Until the goods are found, Mr. W. T. Simpson, manager of the railway department of this company, will hold a continuous reception at Booth 9, Section C, Building 4.

* * *

A new-comer at the convention is the firm of John W. Masury & Son, manufacturer of coach, car and wagon colors, having first introduced them to the trade a half a century ago. At the International Railway Congress, held in Washington in 1905, this company operated one of the first water-colored mills ever built, grinding Tuscan red and distributing samples in tubes. Some thirty years ago this firm entered the varnish field and has since manufactured varnish of the same high standard as its well-known paints.

* * *

The F. P. Harrison Electric & Manufacturing Company, New York, N. Y., is said to have the process of manufacturing its Deltabeston field and armature coils so developed in its large factory that the products are handled by experts at every stage of manufacture. Mr. F. P. Harrison is president and Mr. Ambrose E. Meixell vice-president of this company.

Electric Railway Review

· DAILY EDITION ·

PUBLISHED BY THE WILSON COMPANY
at Columbus, O., in honor of the Annual Conventions of the American Street and Interurban Railway
Association and of its allied associations of Accountants, Engineers, Claim Agents and Manufacturers

COLUMBUS: 83 North Third Street CHICAGO: 1660 Monadnock Block NEW YORK: 150 Nassau Street PITTSBURG: 510 Frick Building
Subscription Price, $1; Foreign, $3; Single Numbers, 10 cents. Application made for entry at Columbus, O., as Second-class matte

VOL. XVI COLUMBUS, O., OCTOBER 17, 1906 No. 10c

Meetings of the Allies.

In his annual address presented yesterday President Brockway raised a question which has been discussed on various occasions; that is, whether it would not be for the best interests of all concerned, were the Accountants' association to hold its annual meeting at some other time and place than those chosen for the American and the other allied associations. The accountants, not being interested in electric railway equipment and supplies to the same extent as are the heads of other departments, there is not the same reason for them to plan their convention in order to benefit by the exhibits which the manufacturers make at the annual meetings. While the exhibits are important and interesting to all railway men, there are certain disadvantages which may result from locating a deliberating body next door to an operating exhibit of air brake apparatus, burglar alarms or the like, which the exigencies of convention quarters have occasionally required in times past. This does not necessarily mean that the accountants need choose a different time and place for their meetings, for the desired object might be achieved were sufficient care taken in locating the association's meeting room. Another point is that conventions are enlivened by entertainments of various kinds which may take the delegates' attention from their work and, if this is found to be a serious matter in the case of this association, the work which the association has accomplished in the past is certainly a guarantee that it would be well to permit it to go its own gait in the future. This matter of having the departmental associations meet at a different time and place has also been raised by some of the claim agents, although for entirely different reasons. The conventions heretofore have usually been held in October. Also the fall term of court in nearly all states opens late in September or early in October, and as, unfortunately, claim agents have much to do with the courts, it is very important that they be on hand at the opening of the term so as not to be among the absentees on default day. There are few except the larger companies on which the claim department has available a force that will permit the chief and his principal assistants, who by all means should attend the annual conventions, to be absent at this season of the year.

Gas Engines versus Steam Plants.

The paper read at yesterday morning's session of the Engineering association by Mr. Paul Winsor on the subject of the gas engine, judged in the light of the discussion following, seems to have thrown considerable new light upon the matter. Mr. Winsor gave the results of practical service of gas engines in a plant of the Boston Elevated Railway Company at Somerville, Mass., in which it was shown that the station has been in commercial operation since May 4, 1906, and up to the time of the completion of the record it had used 1.45 pounds of coal per kilowatt-hour. It was also shown that the plant has proved its reliability and shut-downs have been infrequent. As a result of his experience with this and other plants which have been for a shorter period in operation, Mr. Winsor declares himself fully convinced of the economy and reliability of a gas engine power station. He considers that the fuel consumption will be about one-half as compared with that of a steam plant, running from less than 1.5 pounds to 1.75 pounds, according to the load factor, as against 3 to 4 pounds in steam plants of similar capacity. The plant is also said to be practically as efficient in a small as in a large installtion. On the opposite side of the question is the cost of the gas plant, which is considerably greater than that of a steam plant of similar size. It appeared in the subsequent discussion, which is published on another page, that the justification for the increased outlay necessary will depend largely upon local conditions. One of the speakers called attention to a paper presented at the Philadelphia convention which appeared to convey the impression that the expense of a gas plant was so great that it was only occasionally that it could be economically incurred. While the paper now under discussion appeared to indicate that an expense about twice that necessary for a steam plant would be justified, Mr. Winsor's estimate of the cost of the plant in question was that it was about two-thirds more than what would have been required for a steam plant of similar capacity. It appeared both in the paper and in the subsequent discussion that the question whether a gas plant or a steam plant should be installed would depend largely upon the cost of coal and the facilities for obtaining a good supply of water. The outcome of the discussion was thus narrowed down to the point of a special case and would in no wise seem to justify the prediction made by one of the speakers that if the facts as shown in Mr. Winsor's tests were substantiated in other instances, the doom of the steam turbine would be sounded.

Fields for Standardization.

It is generally admitted that the only point on which all street railway managers agree is that local conditions differ. Assuming the truth of this general statement, there are, nevertheless, a number of minor matters wherein the practice of companies differs needlessly, because the practice is the result of following a precedent set first by accident, perhaps, and not better suited than another to meet the local conditions. Americans are a nation of travelers and the convenience of the traveling public could be enhanced to a considerable extent were the street railway association to use its influence toward making uniform some matters which, while trivial when considered separately, are yet of some considerable importance taking them in the aggregate. One of these things is the symbol used to indicate where a car will stop on the street. In one city it is a pole painted white; in another it is a white ring painted on a black pole; in another it is a red ball supported on a post; in other places the same confidence in the mind-reading qualities of the public is not shown and the sign "Cars Stop Here" is used instead of an arbitrary symbol. In some cities cars stop on the near side and in others on the far side of the crossing and the lack of uniformity in this regard is productive of much profanity on the part of strangers. It is suggested that if symbols are needed to indicate stopping places, it would be a very simple matter for the American association through a committee, to fix an acceptable standard. Differences in practice regarding the near and the far corner are believed to have their rise principally in the ignorance or caprice of city councils and a careful consideration of the relative advantages and disadvantages of the near and far corners as stopping points should permit the formulation of a conclusion on this point that would be convincing and permit railway companies to educate the municipal authorities with which they have to deal and thus secure uniformity in this regard, adopting the practice which is best from the standpoint of the public. Another instance wherein uniform practice could be of some advantage is in the matter of symbols indicating length of service. The passenger of ordinary intelligence wishes to know the meaning of the various symbols which he sees, but, with the plans now in vogue, acquaintance with the meaning of service stripes on the uniforms of street railway employes in his home town does not tell him the meaning of similar symbols elsewhere. The object, and possibly the principal object, of adopting marks of service, is to indicate to the passenger the experience, and hence the ability of the company's servant, and also, therefore, in a degree, the confidence which is reposed in that servant by the company. The use of a variety of symbols for this purpose in some measure defeats the object.

Quick or Delayed Settlements.

The relative advantages of quick or delayed settlements on the part of the claim department were discussed in a paper by Mr. A. J. Farrell before the Claim Agents' association. The conclusion of the author is that the time element in the settlement of claims against railroad companies is entirely subordinate to and is determined by the question of what is fair to both parties. If injuries are slight an equitable adjustment of the claim may be made at once and therefore should be settled as quickly as possible, and slightly injured persons who decline to meet at once the company's claim adjusters may properly be suspected of improper motives in delaying settlement. On the other hand, when injuries are serious a snap settlement is very apt to be unfair to the claimant, as the full extent of the serious injury often is not apparent until some considerable time has elapsed. In such a case the best policy requires sufficient delay to afford an opportunity to determine the facts, and this is the best from the company's point of view, for the reason that a release from liability secured in consideration of an inadequate payment is very easily upset in the courts. The policy of being absolutely fair with claimants is far reaching in its effect. The practical benefit which may accrue to the company from proper methods on the part of the claim department is illustrated by the experience of a trial lawyer retained by one of the larger steam railroad companies. When the cases in which he was interested were about to come up he called in the claim agent of the road and asked that he be present when the jurors were drawn, saying that he did not wish to accept jurors who might be hostile to the company because of having had stock killed, etc., and that the claim agent's wider acquaintance in the community would be of service in keeping prejudiced persons off the jury. The claim agent's reply was, "If you can find a man for whom we have killed any stock, take him as a juror." The policy in such matters had been for the claim agent, as soon as any loss of this character having occurred reached him, to at once send a notice to the person who suffered the loss, naming a time when the claim adjuster would call, or if practical the adjuster would call at once without sending notice. If the complainant were a farmer the adjuster would make it a point to call about dinner time, was usually invited to dinner, and did not discuss business matters until afterwards. His experience was that it was seldom difficult to effect a settlement fair to both parties and that this invariably resulted in making a friend to the railroad. In city work it is scarcely practicable thus to take advantage of that peculiarity in human nature which makes the doer of the favor feel more kindly toward the recipient than were he himself the recipient.

THE SUCCESS OF THE EXHIBITION.

To say that the display of electrical apparatus and supplies in connection with the Columbus convention is the largest, best arranged and most attractively housed exhibit that has ever been held under the auspices of the American street railway associations, may sound trite, but none the less it is absolutely true. The same thing has been said of the exhibits in former years and was equally true when said, but the superiority of this year's display is astounding even to those who have been closely interested in these conventions. One reason for the willingness of manufacturers and dealers in railway supplies to spend large sums of money in installing samples of their apparatus for so short a period as a week, is, perhaps, to be found in the fact that the annual meetings of the American Street & Interurban Railway Association offer exceptional advantages for coming in contact with the men in all departments of the companies. The railways which are members of the association are increasing the size of the delegations sent to attend the convention, and in recent years it has been possible for exhibitors to have personal interviews with managers, engineers and purchasing agents of the leading railway companies from every part of the country. Such interviews would be almost impossible with equal economy of accomplishment were it not for the annual conventions. Too much credit cannot be given to the executive committee of the Manufacturers' association who have had to bear the brunt of caring for the multitude of details in connection with the arrangements for the exposition.

The unusual attractiveness of the individual exhibits and of each building as a whole is largely due, we believe, first, to the fact that there were several buildings of moderate size instead of a single large building, thus permitting to a considerable extent a classification of the exhibits and a segregation in one building of ear-splitting devices which heretofore have dominated the entire exhibit hall. The smaller sizes of the single building permitted giving the great majority of exhibitors wall space, thus reducing to a minimum the interference of one man's display with that of another immediately behind it or at the side of it. Another point which is quite noticeable is that in decorating their spaces nearly all exhibitors followed classical designs, whose beauty is their simplicity.

A number of suggestions have been made to the effect that the street and interurban railway associations, in connection with other large associations holding annual conventions at which exhibits of manufacturers are a prominent feature, should endeavor to arrange for the erection of a permanent exhibit hall designed especially for holding these displays, erecting it at a place where adequate hotel accommodations are available. Doubtless in speaking thus there has been in mind Saratoga, Atlantic City, or some other summer resort where hotels are unusually prominent. In considering this matter it must not be overlooked that the convention of the American Street & Interurban Railway Association convention is essentially a fall or winter meeting and cannot well be changed to summer because of that being the harvest for electric railways, when husbandmen must be at home looking after the crops. At a summer resort the matter of a winter meeting is quite complicated. To open hotels which can provide the accommodations demanded by 2,000 or 2,500 delegates, all of them having "bath room habits and Turkish rug appetites," involves a serious expense entirely out of proportion to the financial returns, if the meeting is to continue for a week or less. At the present time we recall only one city which can give satisfactory hotel and exhibit accommodations—that is, Chicago, which has an abundance of hotels and the Coliseum, which is available for exhibit purposes. Unfortunately, however, a large city like Chicago offers so many opportunies for the dispersion of delegates at times other than when the meeting is in session as to be a serious disadvantage, and there is a marked disinclination on the part of both railroad men and exhibitors to hold the convention in large cities. The matter is one that deserves serious consideration.

CONVENTIONALITIES

Bill's real name is Wayland, not Whalen.

Robert K. Fast, of the railway department of the Central Electric Company of Chicago, is in evidence at the convention.

Mr. Guy R. Jeffries, superintendent of the Indianapolis & Eastern Railway Company, was scheduled to arrive here last night.

Mr. C. D. Emmons, general manager of the Ft. Wayne & Wabash Valley Traction Company, is expected to arrive here today.

Mr. J. P. Clark, general manager of the Detroit Ypsilanti Ann Arbor & Jackson Railway Company, is spending the week here.

Mr. C. C. Reynolds, general manager of the Schoepf-McGowan merger lines in Indiana, was expected in Columbus Tuesday night.

Mr. A. J. Thornley, manager of the Consolidated Car Fender Company, of Providence, R. I., will arrive at Columbus Wednesday morning.

Mr. C. P. Wright, general manager of the Standard Brake Shoe Company, Aurora, Ill., came to Columbus yesterday to attend the convention.

The General Railway Supply Company of Pittsburg is represented at the convention in the person of George W. Provost, Thomas M. Cluley and R. M. Kerschner.

Mr. George S. Hastings, of Cleveland, is attending the convention as a representative of the National Brake & Electric Company and the Blake Signal & Manufacturing Company.

"The hiss of the air-brake and the raucous shriek of the interurban car whistle," is the way The Ohio Sun describes the prevailing sounds at the Fair Grounds on these busy days.

Major Robert E. Mills, of St. Louis, who makes a specialty of convention work for "Krug" and other vinous equipments, is extremely gracious in his greetings to convention visitors this week.

The Southern representative of J. G. Brill Company, Mr. F. L. Markham, of Atlanta, Ga., is attending the convention and Mrs. Markham is also present. They are stopping at the Southern hotel.

A handsome leather bill holder is one of the popular souvenirs of the convention. The Crouse-Hinds Company is presenting them to all delegates and others wearing badges who call at its booth.

The ball given at Memorial hall last night in honor of the visiting delegates and friends was a most agreeable entertainment. The hall was appropriately decorated for the occasion and light refreshments were served.

Some enterprising gentlemen of the darker shade have established a toilet exhibit just outside the restaurant. Water is served a la basin that one may remove part of the accumulation of sand and sawdust from his anatomy.

The Massachusetts Chemical Company has been unfortunate in having its box of souvenirs delayed in transit. It is expected to arrive on Thursday morning. Mr. Baldwin will be pleased to see his friends at the booth in Building No. 4.

Delegates entering the Fair Grounds were confronted at the entrances and on every side by large signs printed in the official colors—red, white and blue—which called attention to one of the leading exhibits. They read: "See Allis-Chalmers Co.'s exhibit of railway apparatus, including Christensen air brakes in Building No. 3." These were also posted in and about the lobbies and corridors of all the principal hotels and appear to have made the desired impression.

On account of the local conditions in which the Detroit United Railway Company is involved it is announced that J. C. Hutchins, president and general manager, and his assistant, F. W. Brooks, will be unable to attend the conventions this year.

A rather unique souvenir which is also a useful one will be sent to those who register at the booth of the Western Electric Company. Incidentally the souvenir, which is a pin tray of novel design, calls attention to the overhead line material of the Western Electric Company.

Mr. A. Gordon, assistant superintendent of the Indiana Columbus & Eastern Traction Company, of Richmond, Ind., came here this morning to attend the conventions. Incidentally he will look after the interests of the Richmond Specialty Company, which is about to engage in the manufacture of a two-way connection for motor leaders.

Those who are specially interested in the case of appendicitis, of which a full diagnosis was given in Tuesdays' issue, will be glad to learn that the operation was performed on Tuesday afternoon and that the patient manifested such symptoms of relief as to leave no doubt of complete and speedy recovery. The successful completion of the operation was the occasion of a lively celebration on the part of the exhibitors in Building No. 6, who have, for several days, displayed a lively concern in the case.

Misfortunes come to many, but the Acme White Lead & Color Works of Detroit, Mich., has apparently received more than its share for the exhibit which it had prepared for the conventions was lost in transit, and despite the best efforts of the railway officials over whose lines it was shipped no trace of it has been found. The display included panels finished in standard colors, samples of truck enamels on steel, semaphore colors and cans of paint. Though the railway company has been unable to explain the loss perhaps the paint can.

"What's the Argument?" is the subject of a striking postal card that has been sent abroad to the electric railway field by F. P. Harrison Electric Manufacturing Company, incorporated, of New York. This card represents a tough looking cowboy with folded arms holding a gun in each hand and has attracted much attention. Those who have seen the card will be pleased to meet the living original who is now doing guard duty at the booth of this company at space 10½, section B, building 4, and taking occasional strolls around the convention halls looking for "arguments."

It is of interest to note the presence in the exhibit halls yesterday afternoon of a considerable number of uniformed employes of the local street and interurban railway company, who appeared to be examining certain features of the display with close attention. They should be warmly received by the representatives of supply manufacturers for the reason that, though they have no purchasing power, yet the success or failure which may lead to the adoption or rejection of a device often lies in their hands and the state of mind in which the hands are laid upon it is influenced largely by a previous understanding or lack of it.

The answers submitted to the several questions sent out by the Claim Agents' association are indicative of the general interest taken by railway men in the endeavor to carry out the plans of the committees. Although it is generally conceded that the characterization of one's own self is not an agreeable task the answers to the seventh question in the series by the claim agents were prompt and to the point The question was: "What qualifications should a claim agent possess?" It is not presumed that the responses were written in front of a looking glass, but it would be gratifying to know that such was the case, as the answers embody the suggestion of exalted ideals.

Mr. W. W. Bean, of Benton Harbor and Chicago, arrived Tuesday. Mr. Bean is now out of the street railway business but he can't keep away from the conventions. He attended the organization meeting in Boston in 1882 and is one of the few, if not the only man, active in the association who has the clean record of having been present at every annual meeting.

An innovation in the matter of training women to refrain from stepping off of street cars the wrong way is now on trial on Oak street line of the Columbus Railway & Light Company. Sometime ago shields were placed in front of the handles of two of the open cars in such a manner that the handles could not be reached from the forward side. It was thought by compelling the women to reach out and grasp the handles with their left hand, while leaving the car from the right hand side of the track, the practice of stepping off backwards would be done away with. After a trial of two months, however, it is declared the project of reformation is a failure inasmuch as the "to-be-reformed" ignore the handles entirely and throw their arm around the side posts and swing off as before.

The editors of The Electric Railway Review are not accustomed to the use of pencils so hard as the name "Cyprus Bronze" would appear to indicate. They are more familiar with the "feel" of Dixon's "Sketching Crayon," which, while it touches lightly, leaves a mark impossible of erasure. Yesterday, however, they tried a new brand bearing the name first mentioned. The name is somewhat confusing as other of the hexagonal faces of the pencil bear the inscriptions "Motor & Truck Bearings and Brass Castings," and "Brady Brass Company, Jersey City, N. J." Maybe "Cyprus Bronze" is not the name of the pencil, after all, but it works all right, whatever be its name. That's the way with the man who gave us the pencils. "Whazher mazzer wizh Dan-" "He's all-write!"

The Ohio Sun published on yesterday morning an interview with Hon. W. Caryl Ely, president of the American Street and Interurban Railway Association, expressive of the general feeling of convention attendants towards the people of Columbus for the efforts which have been put forth to make their stay in the city a pleasant one. Mr. Ely is quoted as saying: "These people have left nothing to be desired; they have accomplished a great deal more than we had any reason to expect, and, although we have rushed a great deal larger number of people upon them than it was understood we would, they have had a welcome for all, and all will be well taken care of. They meet us at every turn with a smile and the glad hand and have given us a welcome such as we have never had in any other city, and have handled this convention as no city has ever done before. None of the visitors has a kick coming. If anyone has, it is the people of Columbus."

One of the jolliest parties that has come to the convention this week was that of the Detroit United Railway Company, which reached here Monday afternoon in the company's private car. A description of this car was given in the Electric Railway Review for September. The party left Detroit over the Detroit Monroe & Toledo Short Line at 9:00 a. m. Sunday and arrived at Toledo two hours later. From Toledo to Dayton the car ran over the tracks of the Toledo Bowling Green & Southern Traction Company, the Western Ohio Railway Company and the Dayton & Troy Electric Railway Company. At Dayton the car was set onto the tracks of the Dayton Springfield & Urbana Electric Railway Company and arrived in Columbus over the tracks of the Columbus London & Springfield Railway Company. The distance covered in making the trip was 282 miles, and although no attempt was made at speed, except on a nine mile tangent on the Western Ohio where a 70-mile clip was struck, the running time was remarkably fast. The party consisted of Mr. E. J. Burdick, superintendent of power of the Detroit United Railway Company; Mr. and Mrs. Irving Fullerton, Mrs. Pierson, Mr. George W. Parker, general freight passenger and express agent, and Mr. Allen F. Edwards, purchasing agent of the Detroit United Railway Company. At Toledo Mr. and Mrs. H. S. Swift and wife joined the party. Mr. Swift is secretary of the Toledo Railway & Light Company at Lima. Mr. F. D. Carpenter, general manager, and Mr. Price, general freight agent of the Western Ohio Railway Company, joined and accompanied the party on the run to Piqua but left the car before that city was reached. The party will remain in attendance at the convention until Friday morning, when the return trip will begin. On the way here the party spent one night at Dayton. On the return journey it will stop over night at Lima. The car is on exhibition near the main entrance to the exhibition grounds.

The Collie and the Dollie.

The melancholy Collie and the jolly dolly Molly
  Went to ride upon the trolley for a frolic.
The jolly dolly Molly, in her hyperbolic folly,
  Said the melancholy Collie was bucolic!
So the melancholy Collie swallowed up the jolly dolly,
  Closed the frolic in a manner diabolic!
But he rued this bit of frolic, for he had a fit of colic,
  Of bucolic, melancholy Collie's colic!

Cleveland Street Railway Talks.

Each day in a four-column space in a newspaper the Cleveland Electric Railway Company presents something new on the street railway situation in that city. The company invites readers who disagree or care to make suggestions to make themselves heard. In a recent issue the company says: "Certain men are promising you 3-cent fares eight years from now, with absolutely no certainty that they can carry out their promises. We do not ask you to wait eight years or eight days. We will give you 3½-cent fares the very day you extend our rights to serve you to such a length of time that we can afford to do it."

Students Building a Railway.

Arrangements have been made whereby thirteen miles of electric railway, a part of the system planned by the company incorporated to construct a road from Lafayette, Ind., to Chicago, will be built by the students of Purdue University. The officers of the company and the faculty of the university have made arrangements whereby the students will have full charge of the work of building the first section of the road, and they have already begun the survey under the guidance of the members of the faculty. This reminds one of the work done many years ago in England, when the students at one of the English universities, under the stimulus of John Ruskin's fervid eloquence, went in for a bout of road making, with pick, shovel and roller.

The Portland (Pa.) Power Company, has been incorporated with a capital of $500,000, the object of which is believed to be to tap the Delaware river a short distance above Belvidere and divert the water for electrical purposes, carrying it through a canal about four mile to Foul Rift, at which point a power house will be erected for trolley, electric-light and power purposes.

In view of the difference as to the designation of alcohol rendered unfit for drinking, some calling it "denaturalized," others "denaturized," and still others "denatured," the following comment from Hathaway, Mont., received on a proposition for a combustion engine generating outfit, is amusing: "Gentlemen, your power may do when we get that 'good natured' alcohol. Not now with kerosene at 30 cents a gallon."

THE ENGINEERING ASSOCIATION.

President Adams called the meeting to order at 10:20 on Tuesday morning and called for the report of the committee on "Standardization." Mr. H. Wallerstedt, of New York City, the chairman of the committee, being unable to be present, Mr. J. M. Larned, of Pittsburg, presented the report. (It is published elsewhere.)

President Adams called attention to the last clause: "It is the hope of the committee that the companies which have not already returned the data sheets will give them prompt and careful consideration," and stated that if the committee is going to do successfully the work that it desires to do, it must have the co-operation of the roads and of the men occupying positions in the engineering departments.

Mr. E. W. Olds, of Milwaukee, said that the matter of standards is one of a great deal of importance, and brakeheads, journals, and journal boxes are matters that can be very easily standardized. His own company's standards were made ten years ago; and they had seen no reason to change except by adding to the other M. C. B. standards as equipments and cars have grown heavier. He started out ten years ago with what seems now to be a very small journal box bearing brass. It was the 3½x6 journal. He had since added to that the 3¾x7 and the 4¼x8, and as he is at the present time getting out some very heavy equipments those will be 5x9. All of them are M. C. B. standards. He stated that he had insisted that should any equipment be made for the company, whether it be a snow plow or a passenger car, work car or whatever it might be, it should take some one of these standards. In the way of brake shoes a Christie head was adopted with such changes in it as was necessary to meet the electric railway conditions. Most electric railways use the flanged shoes, and the head as used by the steam roads does not have the flanged shoe. Since that time, the 33-inch wheel is used with the same shoe. Ten years ago 17 kinds of brake shoes were in use in Milwaukee, but it has not been necessary to order very many of these shoes during the last five or six years. He did, however, believe that it is policy to discard old equipment; it is preferable to wear it out. Equipment that will give you good service will become obsolete and go to the scrap heap quickly enough, no matter how good it is.

He thought the Standardization committee should, with but little trouble, be able to recommend standards, particularly in those matters mention, which can be adopted. The face of the brake head can be so designed as to receive the same shoe on a job of different kinds and types of trucks; the attachment of the brake beam or the lever can be varied, but it is a very easy matter to make them so as to use the same brake shoe.

As far as motor parts are concerned, he believed that to be a much harder proposition to meet, but electrical equipment manufacturers are more than ready to meet railway men on those propositions. The large companies are getting out new equipments constantly, making them to meet various views and the companies must pay the expense. If standards were agreed upon it would lessen the cost of our equipment which is a very important matter. It would also lessen the cost of maintenance.

Mr. Fitz-William Sargent, American Brake Shoe & Foundry Company, being called upon, said that as a manufacturer of brake shoes, he had had some experience in the various designs of brake shoes that are used throughout the country and believed it very evident that there is a tremendous waste and expense incident to the present practice in regard to brake shoes. He referred particularly to the difference in patterns. A large number of roads use the combined head and shoe, weighing all the way from 30 to 50 pounds, and scrap it when less than half worn out, and that is a loss,especially when high priced shoes are purchased. He thought it possible this has been done to separate most of these combined heads and shoes and a number of the roads are working along that line, but the separation has not been in the lines to secure the greatest economy. The shoes still remain, very often a right and left hand shoe, requiring two patterns, and the brakehead is such it would not take the various shoes used by the same company.

He referred to the point that Mr. Olds emphasized and the advantages which he has obtained by substituting a shoe on the Christie type and reduced his 17 patterns to one. He said that there are a number of roads in this country, principally in the West, which are following closely in the lines of the steam railroad practice, and are using a separable head and shoe, known as the Master Car Builders' Standard, in steam practice, and believed that that is in the line of the greatest economy in brake shoe maintenance because that shoe has the metal so disposed that there is the maximum material for wear and the minimum for scrap. It provides a shoe that can be reversed on the brakehead and there is a common head and a common shoe throughout the country making interchange practical and possible without and difficulty; and it seemed to him wise for this committee to consider seriously the recommendations which they have made, or which may be made toward the adoption of the separable head and shoe known as the M. C. B. Christie shoe, for the reasons that roads would thus have a shoe which would not weigh more than twenty to twenty-four pounds, which may be applied and removed at a scrap weight of six pounds, whereas those with the combined head and shoe are generally removed at the weight of fifteen to twenty pounds; and from this proposed standard 75 per cent. of useful wear could be obtained against not to exceed fifty per cent with the other shoe. There would be a steady saving of possibly twenty-five per cent in every shoe purchased.

The fact that the electrical lines are working in connection with steam roads, and that sooner or later electrical equipment will be running with steam equipment on steam lines, seems to make it very advisable that this association should make haste and go on record in the adoption of a standard for practice of brakeheads and brake shoes. He could suggest no better practice than that which has been tried out in the years past on steam roads in so far as the Christie brake shoe and brakehead are concerned.

The secretary read a communication from the Central Electric Railway Association recommending the following standards:

Brake Shoes—We recommend the adoption as standard of what is known as Master Car Builders' standard type of brake-shoe, brake-head and key.

Journals and Journal Boxes—We recommend the adoption as standard for journals and journal boxes the Master Car Builders' adopted standard so far as applicable to motor trucks for axle journals, known as 3¾x7, 4¼x8 and 5x9. We further recommend the adoption as standard for these different sizes of axle journals the Master Car Builders adopted standard journal boxes, journal bearings and journal bearing keys.

Tread and Flange Wheels—We recommend the adoption of a wheel-tread 3 inches wide with flange ⅞ inch high and 1-3/16 inch thick at the throat for both city and interurban work.

Rails for Street and Interurban Railways—We would recommend the adoption as standard of what is known as the "T" form section of rail for both city and interurban work.

President Adams suggested that the matter be turned over to the committee and there was no objection.

Mr. E. W. Olds considered the matter of wheels a pretty hard proposition. Ten years ago the Milwaukee standard was 1¾ tread, ⅝x¾ flange. That was supposed to be as large as could be used. The treads have grown little by little. At the present time they are using for interurban work a 2¾ tread with flange 13/16 deep by 1⅛ in thickness; for the city the flanges are the same dimensions, except that the tread is 2½ inches. That is growing and will be larger. He hoped within the next two years to come up practically to the recommendations of the Central association, and wishes it were possible to get at least 3½ inch tread. In the older cities where there is a great deal of the old work it will be for a good many years to come impossible to do so. It should be possible to operate electric cars upon the steam track and that cannot be done until practically their dimensions as to wheels are adopted.

In the matter of wheels themselves, he said that a great many are using cast chilled wheels; others are using steel wheels. The steel wheel, he thought, without doubt has come to stay. It is today used almost entirely upon his interurban road and he declared it would be a short time before it will be used entirely on city roads.

The trouble is that it is necessary to use so heavy wheel whether it be steel or cast iron. He was a believer in making apparatus as light as possible. It costs us as much to carry around 100 pounds of dead weight as it does passengers.

President Adams called attention to the fact that the committee's report stated that one of the parts or some of the parts to be considered next year would be the motor parts. Upon entering this field there are a number of difficulties to be contended with and it is going to require co-operation on the part of the companies interested. He therefore called upon Mr. E. D. Priest, of the General Electric Company, as to his ideas on that subject.

Mr. E. D. Priest said he was satisfied from his experience there was something which could be done in the direction of standardizing motor parts, although he could easily see it might be carried so far that it would work a disadvantage both to the manufacturer and to the user. Of course, if there was too much of an attempt made to standardize, it might tend to retard progress. On the other hand, if something is not done, it is difficult from a manufacturer's standpoint to keep so many parts to meet the various standards of the different railroad companies. He thought especially in the matter of sizes of axles something might be done in that direction. A manufacturer has to keep in stock gears of various bores and it often gets so that he cannot afford to keep them in stock. He could keep a certain number perhaps, but he could not be expected to keep a full line, and quite often that might delay shipment of equipment, whereas if there were a standard gear, with standard bore and standard length of hub and standard key, it would be possible to make more prompt delivery and it should tend toward a cheapening of the equipment. This would be true not only as regards the gear but also as regards the axle linings. If there could be a standard diameter it would be of great assistance to the manufacturers. If there could be a standard distance between wheel hubs, say the finished distance, it would also be of advantage to the manufacturers. The matter of clearance of wheel flange affects also the clearance of the motor as between the motor from the armature shaft, extreme dimensions, and the clearance between the wheel flange. He thought that something in the direction of standardization there would be a very good thing.

It would be a good thing if there could be some standard gear ratio, but he doubted if that would be practicable, owing to the different characteristics of the service. There might be something done in the direction of a standard size of cables leading from the motors in car wiring and standard size of cables on the car. If the work were begun perhaps in a small way, not attempting to cover too much, it might develop into something to the advantage of both the manufacturer and the user along these lines.

J. S. Doyle said his sentiments were pretty thoroughly expressed in the report of the committee.

Mr. E. T. Munger, of Chicago, thought Mr. Priest's remarks were directly to the point. The motors are directly affected by the brake-shoe and by the tires; that is, the motor must be designed to fit so as to get the proper clearance on the brake-shoes and on the tires. When the question of the brake-shoe is taken up the motor manufacturer had also got to be considered.

Mr. W. H. Evans, of Indianapolis, asked if this committee was to be continued and proceed along the lines that were laid out for the work of 1906.

President Adams said it was so understood; that this was merely a report of progress.

Mr. Evans said he was willing to assume the responsibility of a member of the committee, if there were any such responsibility. He thought, thougn, that it was high time that the association adopted something which would go to the parent organization as a definite recommendation. The work of the committee had been laborious, and there was a great deal of detail work. He said it was unfortunate that Mr. Wallerstedt was not here, but the association owed him a debt of gratitude for the work which he had done in connection with this subject. From the discussion which had already taken place and particularly in view of Mr. Priest's remarks, it was evident that it is essential that an axle be determined upon and it appeared to him that it was the simplest thing for this association to adopt a brake-shoe which is already in general use on nine-tenths of the interurbans and on many of the large city lines. He referred to the the brake-shoe which is in general use on 1,800,000 cars today on steam roads. For the information of the members he said that he had used that brake-shoe quite as satisfactorily on two-inch tracks as he had on the regular M. C. B. standard 3½ inches or more. In regard to axles and journal boxes the steam railroad practice, as early as 1883, decided on a standard M. C. B. box, as it is so-called, which provides for a journal 3¾x7, 4¼x8 and later as the heavier capacity cars came into service, they provided for 5x9.

It appears to him that the simplest thing to help the General Electric Company or the Westinghouse Company or any one else was for this association to say something as to the dimensions of these axles so that it will not be necessary in keeping up repairs to maintain a variety of axle bearings for instance, for the same motor. He would be very much gratified indeed if this committee were able, some time previous to the next convention to recommend something tangible which they would have reason to believe was going to be the standard of the American Street & Interurban Railway Association. In the next twelve months a very large number of equipments will be built trucks and motors will be designed, and it is extremely important that the output for the next year conform to what is expected to be standard. The earlier this committee is able to report the better it would be for all concerned. He thought it would be practicable to act upon the suggestion of the Central Electric Railway Association so far as it applies to brake shoes. He thought an expression from this association which would go to the parent organization at its meeting tomorrow, would carry very considerable weight with it.

In regard to the wheel tread and flange he said that was a matter which will have to be taken up more thoroughly, because this association has not any definite lines laid down for the interurban service, were any such lines laid down by any authority, but he thought that it would be necessary for this association to have a standard less than the M. C. B. standard, which can be used as well on city lines as upon interurban lines. At Indianapolis for the greater portion of the roads centering there, there has been adopted the three inch tread, the ⅞ flange, and 1 1-16 inch throat. They believe that is the fairest compromise they can make, and if this association should recommend that as its standard for interurban lines or elevated railroads which were so situated that they could use the M. C. B. standard it would in no way interfere with that standard. He thought it time that this association had something which could be presented when new tracks are being laid and new railroads are being constructed, in order that they could conform to that. It would be gratifying to the interurban lines if there should be an expression from this association as to what may be accepted as a standard.

President Adams thought it time for the association to make some recommendations. It had been very backward in this work, and some of the work which the committee has in hand should have been completed some time ago, but he questioned whether it would not be better to make haste slowly than to take some action that all might not agree upon.

Mr. G. I. Smith, of Kansas City, wished to ask a few questions. He wanted to know what is the great difficulty in putting a three inch tread into service at once; why was it not possible to put in a wider tread? There are practically the same conditions, Trilby rail up to 137 pounds, girder rail up to 106 pounds and the T-rail from 70 to 100 pounds. He was running 600 cars with from 3 to 3¼ tread and found no difficulty, and put these all on within one year, and would have gone fully to 3¼ except that the trucks would not permit the greater weight. The saving on special work, frogs and switches, made up for any extra cost in making the change. Many of the members were afraid of the granite block, the toothed block, paving brick and all these things. His company bought forty of the cars used in the world's fair which had M. C. B. wheels with flanges running from 1-7-16 to 1-9-16, four inch tread. It was impossible to use the flange and they put the wheels in a lathe and turned down the flange but left the tread alone, and put them out and in two trips they had worn the toothed block level with the rail. They were operating the cars as successfully as those with 2 or 3 inch tread and more so, and he thought the saving on special work, the additional bearing on the frogs and switches, had amply compensated for any granite blocks they may have cut off or anything of that kind.

Mr. Charles S. Kimball, of Washington, speaking of the width of wheel treads on special work said that in some cases they had jumped frogs in city service, because the elevated portion of these frogs were not set back far enough to clear the wide wheel treads. If wider wheel treads were adopted it would be necessary to redesign the special work and put in new work, or grind the elevated portions back to clear these treads. Many have the grooved rails which will not admit of a wide flange nor of the deep flange, and we thought these were points which should be considered thoroughly.

Mr. Paul Winsor, of Boston, could not quite agree with Mr. Evans in asking this association to vote on standards now. There had been standards suggested, and undoubtedly these were good, but as an individual member of this association he would not like to vote on these exact figures. He thought instructions from the meeting to the standardization committe to get out as soon as possible a recommendation to submit to the members would be an excellent thing to do.

Mr. Thomas K. Bell, of Philadelphia, said that having been identified with the special work proposition for a number of years, he believed it might be of interest to the members to start in at the foundation of some of their troubles. As a matter of fact and records, roads are today using from ⅝ to ¾ inch depth of flanges and a greater depth; the average flange in this country is very close to a seven-eighths depth. He would say there were possibly only 4 or 5 girder rails that are rolled by the combined girder mills of the country today, that are really suitable for a flange any more than ¾ inch in depth. The wear brings the head of the rail close to the trams in a very short time. As a tram rail, he said, there had only been one or two sections placed in the market within the last year or eighteen months. In regard to the question of guard-rails, he said there was not a guard rail today rolled that will accommodate a ⅞ inch flange in a 42 foot 6 inch radius, with a 7 foot 6 inch wheel base, without planing that groove. That has brought on the buyers an additional expense. They pay more for their special work, the cost of the planing of the rail, and the rails themselves are very much destroyed after having the original rolling scales planed off. He thought there was today a crying necessity on the part of the street railways of this country to get together on the question of the adoption of a suitable design of rail, and insist on the rolling mills of this country getting them out. That is one of the most urgent things. In the T-rail such as they have in Milwaukee, both in the girder T and the low T, that question is set aside.

There are at the present time many propositions involved in practical operation—for instance, the N. Y., N. H. & H. R. R. are figuring very closely on trying to bring some of their M. C. B. flanges and treads right off the steam line into the city work. There is not any of the city work today that will stand it, and he said it was only a question of a few years when the entire track structure would be destroyed by a flange going anything beyond the present depth of ⅞ inch; in other words, the best rail will only allow a vertical wear of 5-16 inch.

As a matter of fact, he said there was not a decent Trilby rail rolled to accommodate a ⅞ inch flange outside of the P. R. T. section in Philadelphia. That was the only rail which would admit of a reasonable number of years of wear, before commencing to cut down the trams of the rail. In following up the remarks of Mr. Evans he thought an approach to the ⅞ inch flange, with at least a 3 inch tread, possibly a 4 inch tread, would be the thing that would perhaps soonest solve this problem. Mr. Kimball raised the objection to wider treads being introduced owing to the fact that in many places they had jumped the frogs. In answer to that he said that there were very few cases of that kind compared to the number of pieces of special work in the country, and he did not consider it a very great difficulty to overcome. He said he was rigging up machines to go through his entire system, to grind the edges of the pavement, so as to overcome this difficulty. It was a very inexpensive operation when done in the right manner, but it was also a very necessary one, otherwise the destruction of the wheels would be very severe. The question of flanges had always caused the special work manufacturer a lot of thought.

Mr. H. B. Fleming, of Chicago, said that the subject of standardization was probably the most important one to consider at the present time, as there was a large field for introducing operating economy, but he thought it wise to move slowly in introducing these standards. He stated that about five years ago the Chicago City Railway had adopted an M. C. B. truck and since then had adhered to that type of truck making only such changes as were found necessary, due to increase in weight of equipment, so that at the present time there are in use about a thousand trucks of that type. He said that had helped out greatly in maintenance. In the matter of rails the speaker said the companies were not at liberty to select the type of rail they wished. In many cases, especially in Chicago it has to consult with the city authorities, and it was very hard to convince them sometimes that they had the right design. He had in his office about thirty-five samples of sections of rail which have been used on his road at different times, showing the way the matter has developed. He had just designed a new standard which has been adopted for the city of Chicago, and thought he was out of that trouble. There are so many things which ought to be standardized that it is hard to know where to begin. One man wants one line of apparatus standardized and another man wants another line of apparatus standardized. In the matter of painting cars, he had tried in the last two or three years to paint all cars of the same color. He said his company was trying to get a standard motor, and the trucks he had mentioned were all equipped with standard motors. They had also adopted standards in connection with our wiring and were also adopting a standard air brake. Regarding the tread and flanges on wheels, a ⅝ inch flange was made necessary by reason of the fact that the city authorities require a very shallow groove in the rail. They insisted at one time that the groove should not be of greater depth than 1⅛ inch. The present standard is 1¼ inches. Recently in Chicago the question of valuation of the street railway properties had arisen, and the engineers who are representing the city in that valuation, have taken the stand that the rail has no value at the time when the flange is running the bottom of the groove. It is very necessary to get a good, deep wide groove capable of allowing the use of larger flanges than has been the custom. He agreed with Mr. Smith that it is advisable to make the tread as wide as possible. The tread takes care of the paving stone, and does not give any trouble.

President Adams then appointed as a committee to frame resolutions and submit them on Wednesday afternoon. Messrs. Paul Winsor, G. J. Smith, W. H. Evans, Thomas K. Bell and John S. Doyle.

The next paper, "Gas Engines," was read by Paul Winsor, chief engineer motive power and rolling stock, Boston Elevated Railway Company, Boston, Mass. It is published elsewhere.

In amplification of the paper Mr. Winsor said that the plant has been running another month or more since the paper was written and is still running extremely successfully. The greatest load had been 820 kilowatts for the station rating at 700, or about 18 per cent overload for the hour but that part of the time it had been considerably higher. He said that he had rated the stations down much below the engine rating.

Mr. Fred N. Bushnell thought it would be of great assistance in the study of the question if Mr. Winsor would enlighten on the subject of what producer gas is and its method of manufacture, which Mr. Winsor did at some length.

Mr. Thomas Hewett, of Philadelphia, referred to the paper read last year at Philadelphia on "Gas Engines," by Mr. Bibbins. He said that that paper did not show anything like the results given by Mr. Winsor. That paper was criticized quite fully by Mr. Mailloux, of New York, who showed that only in a few instances would the gas engine plant stand the extra cost; in other words, the plant was so much more expensive than a steam plant that it was only occasionally the extra expense could be incurred. The discussion at that time had a tendency to run to a comparison between the steam turbine and the gas engine. He recalls that the steam turbine at that meeting was quite prominently brought forward and upon the best results given by the steam turbine in Mr. Winsor's territory, economy of 2.6 to 2.8 pounds of coal per kilowatt hour was shown, using the same kind of coal Mr. Winsor is using in his gas plant.

If this date is correct, he continued, Mr. Winsor's paper showed that about twice as much could be spent for a gas plant as a steam plant in order to get the same final result, and if that was the case the paper looked very favorable for the gas engine plant.

Regulation of the engine being a serious matter, it was his belief that the gas engine has been developed sufficiently well for use with direct current generators, but he was not sure that the regulation has been obtained sufficiently close for alternating current generators and he would like to ask if that was the case. If it was, it seemed to him the turbines are doomed.

Mr. Winsor said he was using direct current and had no trouble about the regulation. That is to be expected. He understood that there are a good many gas engines running on alternating current and the reports to him were very favorable as to governing.

Mr. H. B. Benghler, of Ford, Bacon & Davis, said he had an experience last year with a 400-horse power Crosby engine, four cylinder, 32x36, at Elmira, N. Y., where he operated successfully a 60-cycle apparatus, three-phase; he had absolutely no trouble at all, so far as the parallel operation was concerned.

Mr. E. P. Roberts, in answer to the remark that the gas engine would cut the fuel bill and that one could afford to pay twice as much for the power house, thought that was a question. The fuel bill was not the only thing. There is interest to pay on the money. He said he had occasion in the last two years to examine parallel operation quite carefully, to such an extent that at the present time he was considering the advisability of putting in a 1500-kilowatt gas engine plant, 30-cycle railway sub-power house for some 150 miles of traffic. The power house as located now was not anywhere near the center of the system and also they were very short of water for domestic purposes. The question was whether that power house should be enlarged or another power house of any character be placed in an entirely different location. He considered that it was a financial proposition which must be met in each case.

The question had been asked whether it was a fair inference on the paper that if coal cost $3 or more per ton the gas engine plant would be preferable. He did not think any such general inference could be drawn.

The speaker also expressed a hope in the final publication of his paper Mr. Winsor would see fit to submit actual figures from actual operation.

He also expressed the view that much of the efficiency of the gas engine and the efficiency of the steam engine depend on the average load. It was stated in the paper to be 84.5 per cent, which possibly might give the impression rightly or wrongly that one or both engines were operating all the time at that load. He thought it would be desirable to have a load diagram showing when the engines were thrown in and out and what the operation of those were, because the gas engine will not take the maximum overload as compared with the rating a steam engine will take. That might not be advisable in this case, but the result of the figures given must be analyzed by the load diagram in order to give the full information. The rating here, as figured out, is 66.8 per cent. The important matters or some of the important matters to be touched upon are the comparative first coats and, therefore, the capital charges and what interest one has to pay for money. That affects that largely and the cost of the price of the various fuels obtainable suitable for steam or gas power production, whatever it may be.

Mr. Winsor stated that these stations are practically sub-stations. The question was of putting in these plants or adding to the present steam plant. Figures showed that the plants had cost about $80 a kilowatt more than our steam plant and the cost is almost exactly what the additional economizers would cost, so that the plant stands us today at the same figure as if economizers had been added to the present plant, besides which a very much better voltage is obtained.

Mr. Hewett asked Mr. Winsor to give the ratio of first costs between these plants and what a condensing plant would have cost in the same locality, assuming that the buildings would be suitable for either plant.

Mr. Winsor replied that these particular plants cost about two-thirds more on the rating given them—not on engine rating, but on station rating—about two-thirds more than a steam plant would cost.

Mr. Hewett rejoined that it seemed a case in which Mr. Mailloux's argument last year pretty nearly held true. He did not want to be taken literally in his statement when he first spoke, that a station of double the cost could be used. The coal in a steam plant would cost about 50 per cent of the cost of operation if assumed that the labor costs were assumed as the same for gas and steam and that the sundry costs were about the same, it naturally would not be right to say double the cost of the plant.

Mr. Yawger of the Westinghouse companies was called uopn and said that there was one subject entering into this gas engine consideration that has been touched upon once or twice here and that was the question of water used. Mr. Winsor in his paper said his plant used about 200 pounds of water per kilowatt hour. That struck the speaker as being quite a good deal of water for a gas plant, although much of course depends upon how hot he runs the water. Another feature of the use of gas engines was that they seem to go in special location like locations where there is little water. He concluded that gas engines are at the present time to be looked upon as desirable in special locations; where coal is high, where it costs $3 and upwards per ton, where water is scarce and other conditions like the saving in copper, etc. Of course, the cost per horse power of the gas engine is bound to be a good deal more than the cost of a steam engins unless it is learned how to make gas engines a great deal lighter per horse power than now.

President Adams declared the discussion closed.

The paper by Mr. H. G. Stott upon "Underground Cables," was read by Mr. Green. It appears elsewhere.

Mr. Boardman Reed desired to emphasize, first, the character of ducts to lay cables in. He declared that they are rough on the inside with little points projecting, that cut the lead sheath and render the paper cable almost valueless if the duct is all wet or damp.

Second, he did not think quite care enough was used in laying ducts, especially where they are laid on horiozntal or vertical curves, and thought that more care should be taken to see that the joints are smooth, especially on the inner radius of the curve so that the lead sheathing of the cable will not be damaged. Mr. Reed stated that the first cable for high potential laid in New York City was laid in about 1886. It was laid without any lead sheath and operated for something over fourteen years without any trouble whatever. That was before the day of automobiles which humped the price of rubber to a dollar and a quarter a pound and when labor was not quite so high. At that time the manufacturer of a rubber covered cable could afford to do a little better than one of the representatives of one manufacturer said he had to do the other day. He said these inspectors came around and they used the only biscuit of para rubber that he had, that he kept for show, but in those days, all had lots of the biscuits of para. He believed that the rubber covered cable, if the engineers felt they could afford it, would stand in damp places, but it comes high.

Mr. Winsor said he had had a great deal of trouble with return currents on lead sheaths the heavy currents burned the leads out at bonds where they were touched and had a good ground and that was so serious that in almost all cases now he cut a lead sheath an inch or two off each side where it enters.

Mr. Latey related an instance in connection with the Manhattan installation. The usual practice of using the heavy structure for return was followed with the usual results. When they came to the subway they had no structure and about the time they were ready to lay out the negative return circuits they had to give one of the rails up to the signal people which left one 100-pound rail for a return circuit for about two miles and a half of structure. All kinds of schemes were figured out for putting in copper and incidentally they figured up the output of the copper market and it did not look as though there would be much copper left for anybody else, so the only thing that could be done was to put in insulated negative cables, fitting in in four places in between substations—that is having four points of collecting the return current and carrying that insulated cable back to the substation. That gave a potential difference of perhaps sixty or seventy volts between points on the return rail and the sub-station bus but only about five or six volts difference of potential between the return rails and the water pipes in the immediate vicinity.

Mr. Alfred Green said that about 1901, in Rochester, when the Bell Telephone Company made a test for electrolysis they were getting considerable return current because the question of bonding was not given a great deal of attention. The only solution of that problem was to run a cable parallel with theirs, 0000 wire, which was done, through the duct and connected to the negative side of the bus-bar, and went to the point with this cable, where the cable was positive to the rail. All the joints that were made between that cable and the telephone cable were plumber's joints. That cable is in the same duct today. Later with the three-phase system the electric light companies there had to put their wires underground within a radius of about ¾ of a mile around the power station. There was all sorts of trouble with the electric light company, and it was realized the thing to do was to put in something which would bring the current back to the power house. Cables were run in the ducts leading back to the power house, the cables insulated and all joints soldered. Within 350 feet of the power house the cable became positive to the ground. The cable was insulated to the power station and all the cables run through circuit-breakers and the speaker thought the same construction was now there. There was absolutely no trouble after that.

Mr. Charles S. Kimble, of Washington said that there has been considerable trouble in Washington with the sheath cables being grounded, not in the manholes, but between the manholes, and that the difficulty was caused by the cement-lined iron ducts. The cement becomes brittle and cracks and separates from the iron. That causes the ground. These iron ducts are being removed as fast as circumstances will permit, and it is understood they are not manufacturing them at the present time. In laying new ducts a scraper is used which has been designed of four steel blades and every piece of duct scraped, terra cotta and tile. That eliminates those small points on the construction which are likely to injure the lead sheeting in the cable.

Mr. Paul Winsor asked how members test their cables.

Mr. H. N. Latey, of New York, said the only tests he made on the direct current cable is the volt meter insulation resistance test. Insulation resistance is obtained by means of a 700-volt volt meter. The high potential cables are not tested periodically. They are tested occasionally on changing connections and in the case of breakdowns and that is about the only test that the cables are getting. In the case of a 11,000-volt cable, a 19,000-volt breakdown test for about five minutes is used, which is very much below the contract test.

Mr. Winsor said his company bought its cable on a guarantee that the insulation resistance shall not go below a certain figure in a certain number of years. The cable is tested every two weeks. The curve of the insulation test is followed very carefully. If the insulation goes down, it is apt to go down rapidly and the curve will flatten out. When a cable gets below a certain point, its insulation depending on the character of the cable and the previous history of it, it is watched very carefully. The makers say that does not mean anything; that with some cables you can get down to one megohm per mile, a perfectly good working cable for 500 volts. His experience was that if a cable falls from 200 megohms per mile to 25 and keeps falling steadily, it will keep on falling.

Mr. Latey said that with their high tension cables with the grounded path that Mr. Scott mentions, it is not a breakdown test, but is a means of cutting out the cable on a breakdown, which does not affect the system to any extent; that is, a cable will trip out, as has been the case, three or four times, since they have had them in service, a 11,000-volt cable will go out on short circuit and trip out both the power house and sub-station, and no one will know anything about it until the indicator works. It works so well that the breakdown tests are hardly necessary.

Tuesday Afternoon Session.

President Adams called the meeting to order at 2:30 o'clock and called for the paper on "Relative Economy of Turbines and Engines at Various Percentages of Rating," by

Walter Goodenough, engineering department Stone & Webster, Boston, Mass.

The secretary read the paper, which is given elsewhere.

Mr. Paul Winsor thought this paper interesting in starting thinking on the subject of investment as to its bearing on total cost of operation, but it seemed to him that it was a paper particularly interesting to he financial end of the business and the constructing and designing engineer. He could not agree with Mr. Goodenough that it affects the operation at all. In a given plant, interest charges go on and the only thing to do is to lower the cost of operation. The question of interest charges should not be considered after once getting the plant, but the plant should be at the lowest cost of operation. The point of possible increase of plant is up to the designing engineer, and he should take the interest charges into consideration or consider whether or not present plant should be at heavy overloads or low efficiencies or be added to with increase in the interest charges. He did not agree that the operating engineer should take into account the quesion of fixed charges.

Mr. H. N. Latey, of New York, said in regard to the statement in the paper: "From these characteristic curves, therefore, it becomes quite apparent that we can not carry our steady loads per unit any too near 100 per cent rating, that Mr. Stott had during the last year been making some tests on our 59th and 74th street plants in New York City, and found with the engines that there is a very marked economy on running on an underload; that is, a 5000-kilowatt unit operated at considerable underload will operate cheaper than it will on the rated load of the machine; the engines are apparently designed for a fluctuating load, with the engine underloaded rather than overloaded, and it was losing economy on running up on a load that carried a practically steady load such as occurs in the rush hours at those power houses. He also referred to a paper by the American Institute of Electrical Engineers on that subject, which might be of interest to the members referred to.

President Adams announced that tomorrow afternoon the association would meet at two o'clock in the meeting room which the claim agents have been using, on the third floor of the administration building. He appointed as the committee on nominations Messrs. W. B. Reed, New York; D. F. Carver, Rochester; H. B. Fleming, Chicago; M. O'Brien, St. Louis, and Alfred Green, of New York.

Mr. Frank A. Davis, president and general manager of the Scioto Valley Traction Company extended the courtesies of that line to the members of the Association, application to be made at any station between 7:30 a. m. and 5:30 p. m.

The next paper, entitled "Economy in Car Equipment, Weights and Schedules," by E. H. Anderson, Schnecetady, New York, was presented.

President Adams stated that Mr. Mower had intimated to him that this year will be his last as secretary. He had taken upon himself the duties of general manager of a road, and these duties will not permit him to give the necessary attention to the affairs of the association. He said to Mr. Mower, for the association, that his efforts in the past had been of great value to the association, and the result of his work in the old association when it was a question of getting in new members and similar work put the association on the basis it was in at the time of reorganization. He thanked Mr. Mower in the name of the association for his efforts in the past.

(Vice-President Simmons in the chair.)

Mr. N. W. Storer in opening the discussion said he had been making a more careful study every year of all the conditions that go to make a successful operating system, and one which would pay a profit. He thought the paper was a very excellent presentation of a most important subject. The conclusions reached in the paper were so logical that it was hardly possible to contradict them.

He thought one of the greatest features in selecting motor equipments for successful operation is to get the right reduction for the motor. There have been thousands of dollars wasted and thousands of equipments given a very bad reputation simply because of the selection of a bad gear ratio. The motors may be geared for entirely too high a speed or they may be too low a speed. A proper study of the conditions was not given before the gear ratio was selected. Suppose a gear ratio selected which is too high speed, of thirty miles an hour, when service requirements are such that you only need a maximum speed of 15 or 20 miles an hour. The motor will be run at a low voltage practically all the time. He had in mind a road where the motors were operated at an average voltage when the power is on the motors of about only 275 volts while the line voltage will average practically double. That means the motors have their capacity cut in two, and they are operating about half the horse power capacity which they would have if they were operated more on the high voltage. To get the capacity out of the motor designed for 550 volts it is necessary to have that voltage as large a part of the time as possible. That is where the high speed gear reduction will come in. If operated at too low a reduction, that is too low a speed, the motors must be forced, the power kept up to the limit, and shut off, and it will be found that braking at the maximum speed, applying the speed at the highest speed, a large part of the power in the motor is lost in the brake shoes. This not only wears out the brake shoes, but the coal pile at the same time. That is where the slow speed gear gets in its bad work. The lower the speed gear the easier as a general thing it is for the motor to get over the ground, that is the lower the heating will be; that is not always the case, but it is in general.

He added that there is a great tendency on the part of people who go into interurban work to adopt gear ratios which are really beyond the requirements. They want to reach a maximum speed of forty-five or fifty miles an hour, while the track conditions may not be such as to make it possible to use that excessive speed for any considerable part of the time. They sacrifice a great deal in the capacity of the motors to gain a little in the speed on a small part of the line. He thought that a mistake. It would not be so bad if they could get sufficient motor capacity at the same time, but they select a quadruple equipment of 75 horsepower for a 35 ton car and gear them for a very high speed and the result is that the motors are badly overloaded. They might do that scheduled speed all right if they are properly geared for it, but he thought the point very well shown in the curves, the effect of the high schedule speed on the capacity of the motors which are required, and a careful study of those curves would pay any man who is in the operating business.

There was one point brought out in the paper in regard to the number of motors in an equipment which should be further dwelt upon. It was stated quite correctly that a great deal of trouble is experienced from the wheels of the car slipping where the weight is not all on the driving wheels. That is very apt to be the case, and it compels the companies to adopt four motor equipments where two motor equipments would do just as well, if they did not have this slipping. There is one point he wished to bring in there which he thought would help very materially in many cases to obviate that trouble from slipping. A great deal of trouble, he said, is due to the fact that the hand controller which is used is operated very loosely as a general thing, and the motorman may throw it on, giving the motors very heavy rushes of current. That will momentarily give a very high torque, and start the wheels to slipping. He believed the adoption of the multiple unit control equipment for the street cars with purely automatic acceleration will go a long way toward avoiding that trouble. There the control is practically beyond the motorman; it depends entirely on the adjustment which the control is given before it leaves the depot. If it is adjusted for 150 pounds per ton acceleration, that is what it is going to get. If we have a double truck car, we will have at least 60 per cent of the entire weight on the driving truck wheels. That should give acceleration to the car of 150 pounds per ton with about 12.5 per cent adhesion. He believed there could be obtained with a little sand, at least 12.5 per cent adhesion on the rails even if they are very slimy, and that will give a very good acceleration. A mile and a half per hour per second is to be commended for practically all the city work, although it is exceeded in many places, and is much less than that in others. The fact remains, whatever the acceleration it should be fixed in the car depot before entering on the road. That is an advantage which must not be overlooked and the importance of having a certain rate of acceleration is plainly illustrated in these curves here, and it is only easy to take advantage of them by having the automatic acceleration.

While it might not be directly under discussion on this paper, at the same time, he thought it would not be out of place to show the economies which can be secured in other directions by the use of this same multiple unit control for the street cars. In many cities the cry is "There are not enough cars." The trouble is in the crowded condition of the streets. It is impossible to force more cars through the streets; the streets are so crowded that with the present conditions, operating one car at a time, there is a very inefficient operation. It seemed to him that by coupling two or three cars together, a very large increase in the number of cars operated may be easily secured. He was glad to note from the discussion yesterday how many people there are who are thinking at the present time of the multiple unit control equipment for street cars. It was entirely in the right direction. The use of it in the crowded streets would be of benefit. If three cars are coupled in a train, two spaces between the cars are avoided. These spaces are entirely useless, and if the cars are running close together it would be found that wagons creep in and people are crossing the street and there is much interference with the traffic all the time, one car must stop at a time and the car can go along only in asuccession of jogs. If there are three cars in a train, two of the spaces can be obviated and the time spent at crossings and in clearing blockades is very much reduced. At crossings only one signal from the corner man will take the three cars across the street, otherwise three signals must be given, and there would be greater interruption of the service. About the only difficulty he could see in such operation is in the coupling of ths cars, but he thought that could be obviated. The use of the multiple unit control will also partially dispose of the last paragraph of the paper which states: "The above illustrates strongly that the largest car which can be run, and the proper frequency of cars maintained will give the least cost per seat or passenger mile." That is on the basis of having the single car equipments. If multiple unit control is used, the fixed charges on a large train are cut down to a very great extent, and the smaller equipments used to much advantage.

Mr. E. D. Priest thought too much emphasis could not be placed on the careful consideration of the service requirements before choosing the size or type of motor. It would be greatly to the advantage of both consumer and manufacturer if they would get together more in the consideration of this problem. If the user would indicate clearly to the manufacturer just what his service conditions are, going into considerable detail, giving the weight of cars, number of stops, and general character of the service, the manufacturer can be of great assistance in choosing the proper equipment. He agreed with Mr. Storer that very often an improper gear ratio is selected, and usually it is too high a gear ratio. This not only results in greater consumption of energy for a given schedule, but also results in an abuse of the equipment. While perhaps it is too broad a statement to make, he thought that generally speaking it may be said that the lowest speed equipment which will perform the service is usually the best one to select. That is a broad statement, but it is the side to lean on. Therefore, when a street railway man calls for a speed of 45, 50 and 60 miles an hour, he thought he should very carefully consider the results of using such a high speed equipment. In the great majority of incidents he believed a low speed equipment would fulfill all the requirements and do it with much greater economy.

Mr. E. W. Olds, Milwaukee, agreed with the proposition as stated by the different speakers and it bore out his views as to the maximum speed that so many operating men require the rolling stock men to have for their gear ratios. They often say that they wish to make 40, 50 or 60 miles per hour, when the facts are they do not average 25 miles per hour. As a consequence, our motors are overworked, very often burned out. He knew in his own case where some motors were arranged for 45 miles per hour, the gear ratio was changed to bring them down to about 35 miles per hour. It was found the consumption of energy, operating on the same schedule, making the same speed with the same cars, very much reduced. At the same time, the maintenance charge was reduced to a very considerable amount.

Mr. W. E. Rolston, of Canton, had in mind some experiences he had in the past six months with different gear ratios used on the G. E. 73 motor. In the one case with the gear ratio of 1.7 he got a maximum current of 950 amperes, while in the other case with a gear ratio of 2.3, same motor and same weight of car, four motor equipment, about a 40-ton car, they had a maximum of 625 amperes. The rise in temperature, maintaining the same schedule and practically the same stops—observation taken on similar days under similar conditions—was 30 degrees more in the case of the high geared motor. The current consumption as taken by a recording watt meter was very little in excess in the case of a high geared ratio. The fact was that the maximum jerks in starting seemed to be responsible for a large amount of the heating, but on two of the equipments which we reduced down, the gear ratio was changed back again to 2.6 and still better results found. Taking the average as a whole the business could be handled with the gear ratio at 2.3 with considerable less effected maximum pull at the power house than it could in the other case. The only instance he had in mind where the high gear ratio might be adopted to good advantage would be in the case of limited service, with very few stops of eight or ten miles apart. Then the higher gear ratio might come in to fairly good advantage and prove profitable, but where the stops are frequent, averaging a mile or a mile and a half apart on interurban service, the high gear ratio would be a detriment. Another trouble was the failure of fields on this particular motor, G. E. 73. On an average defective fields run one to three, in favor of the lower gear. It seemed as if those on the higher gear were heated up to a higher temperature and more liable to flashing, and causing trouble of that kind, and it was not uncommon to pull out burned out fields once in every tw oweeks on these cars. The previous management had supplied the road with gears to change them over to the high ratio, but after making a careful investigation it was decided better to go back to the lower ratio.

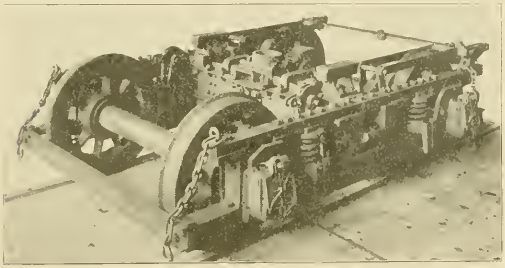
Mr. N. B. Storer said there was another point which might be mentioned in connection with the question of gear ratio. It is frequently deemed advisable by the management of a large system to select one standard gear for all classes of service. In view of the developments which have come up and the necessity of making changes, he asked whether it was not best to capitalize that standardization work and see how much it is worth to the company; whether it would not be better to keep one standard motor and gear it for several different classes of service if necessary on the same system, gear it properly and get the benefit of the lower power consumption, and the longer life of the motor, but have it so that the equipment will not be changeable. That point should be capitalized and see how much it is worth.

The vice president suggested adjournment to make a careful inspection of the exhibits.

On motion of Mr. W. H. McAloney of Denver the consideration of the question box was deferred until the next session, and adjournment was taken till two o'clock Wednesday afternoon.

BALDWIN ELECTRIC LOCOMOTIVES AND TRUCKS.

The first electric locomotive built by the Baldwin Locomotive Works was completed in 1895. It has been followed by a large number of electric locomotives, which have been facturing Company. These locomotives have been designed built in conjunction with the Westinghouse Electric & Manu- for service in mines, furnaces, mills and industrial establishments; for local freight and passenger traffic, switching and other special service. They have also been built to replace steam locomotives, where for various reasons, the use of the latter has proved objectionable.



Baldwin Motor Truck for West Jersey & Seashore Railroad Company.

The lighter electric locomotives are usually of the four-wheeled type, with two motors, and of a capacity to suit the working conditions. For mine service this type has been extensively used, as the locomotive can be compactly built and designed to pass through restricted openings. The frames of mine locomotives are usually of cast iron. For surface haulage four-wheel locomotives may be fitted with a closed cab or open canopy as desired. The frames are made of cast iron or of steel channels.

For heavier locomotives the double-truck type, having four motors, is generally used. The frames are of steel channels, or are built up of steel plates and angles, and the cab is preferably placed in the center of the locomotive, or it may extend the entire length of the frames. The Baldwin plant is now delivering 35 locomotives of this type to the New York, New Haven & Hartford Railroad Company, for use in passenger service out of New York City. They are equipped with alternating-current motors, and are each of 1,000 horsepower capacity. If desired they may be operated in pairs from one controller, thus doubling the power available for hauling the train. These are the largest electric locomotives thus far built by the Baldwin Locomotive Works. Designs are now completed for three two-unit locomotives for the Grand Trunk Railway. These engines will be used in switching service. Each unit is carried on three pairs of driving wheels, and is of 675-horsepower capacity.

The largest annual output in the history of the works was produced in 1905, when 2,244 locomotives were built, of which 141 were electric. During the first nine months of 1906, January 1 to September 30, inclusive, the production was 1,916 locomotives, including 150 electric locomotives.

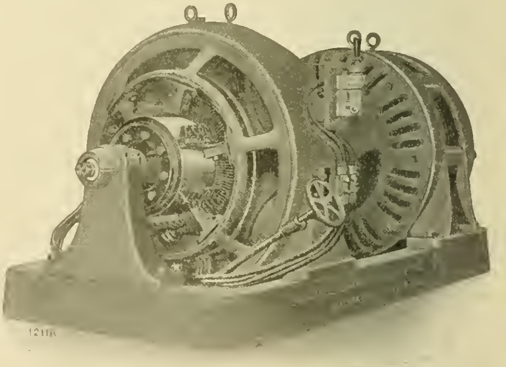
The Baldwin Locomotive Works has recently completed a new electric truck shop, having a capacity for 100 trucks per week. The requirements of modern electric street and interurban railway are particularly severe, and trucks must be designed to suit the particular conditions under which they are to operate. The experience of this firm in designing steam locomotives, enables it to produce a truck fully up to the standard of the best locomotive practice.

In its general design the Baldwin truck follows closely the lines of the Master Car Builders steam railroad truck. The strains due to the weight and torque of the motors are provided for by a stronger construction and different distribution of weight, but the M. C. B. method of equalization of the load, swing bolster construction and general features are retained. Baldwin standard trucks are arranged for inside-hung motors and inside-hung brakes. They are designed to carry from 22,000 to 35,000 pounds, on the center plate, the wheel bases varying from 72 to 90 inches. These trucks weigh, without motors, wheels or axles, from 4,500 to 6000 pounds.

If desired, any of the standard designs can be modified to suit special conditions. Trucks may be arranged with outside-hung motors, permitting some reductions of wheel base. Electric freight trucks, which have arch bar frames and coil springs, are also manufactured. In addition, the output includes trailer trucks, which are constructed entirely of metal in accordance with motor-truck specifications.

NEW MOTOR-GENERATOR SETS FOR THE COLUMBUS RAILWAY & LIGHT COMPANY.

The National Brake & Electric Company, of Milwaukee, Wis., has recently installed in the Milo power station of the Columbus Railway & Light Company, a 500-kilowatt motor-generator set. This set is of the three-bearing type and consists of a 750-horse-power, three-phase, 60-cycle motor, operating at 600 revolutions per minute which drives a 500-kilowatt direct current generator. This company has also recently installed in the High and Town street substation an induction motor-generator set which is used for bridging in on the underground Edison lighting circuit. This set comprises a 375-horsepower motor wound for three phase, 60-cycle, 4100-volt current, driving a 250-kilowatt, 250-volt direct current generator at a speed of 720 revolutions per minute.



New Motor-Generator Set for the Columbus Railway & Light Company.

The Atha Steel Casting Company, of Newark, N. J., is the only company in this country making a motor gear which cannot be machined. The wear in service has been definitely established to be about five times as long as ordinary cut gear and the gears do not break or loosen on the axle.

UNDERGROUND CABLES.*

BY H. G. STOTT, SUPERINTENDENT MOTIVE POWER, INTERBOROUGH RAPID TRANSIT CO., NEW YORK CITY.

The use of underground cables for the transmission of power by electricity has become so universal that no apology is necessary for bringing before the members of this association a few points which seem to the author to have failed to receive the attention they deserve.

Underground cables, as used by the members of this association, may be grouped into three classes, viz:

1. High tension multiple or single conductor cables of relatively small current carrying capacity, but capable of operating under working pressure from 2500 to 25,000 volts mean effective pressure.
2. Low tension single conductor cables of large current carrying capacity, but only operating under pressure of 650 volts or less.
3. Negative return cables of large current carrying capacity, but only operating under a pressure corresponding to the drop in the return feeders.

The first class, comprising what is popularly known as high tension cables, has developed by a process of evolution from the time when nothing but rubber was used for insulation, to the present time where rubber, varnished cambric, saturated tapes and paper insulation have been brought to such a state of perfection as to leave little to be desired.

Higher potentials than 25,000 volts have not been attempted as yet in underground cables, but there seems to be no reason why a voltage of 44,000 should not be used with exactly the same degree of safety as 25,000, provided a star connection is used in the transformers and the neutral point is grounded, for then the maximum strain is limited to 25,000 volts to ground. It would thus seem that our cable manufacturers have almost kept up with the development in overhead construction, as at this time 60,000 volts is the maximum pressure in use in a few cases only, and the great majority of important transmission schemes are under 50,000 volts.

For economy, principally, rubber insulation is only used where local conditions seem to demand an insulation which is impervious to moisture, so that in case the lead sheath should be punctured the cable will not necessarily fail. As an instance, where cables have to be installed in ducts which are under water part of the time or for submarine cables, the extra investment for rubber insulation would seem to be justified, as in the event of a leak in a submarine cable lead sheath it usually becomes a total loss if insulated with paper or other non-moisture proof material, whereas good rubber will last indefinitely under water. For potentials above 22,000 volts, it seems likely that some form of varnished cambric or impregnated cloth will take the place of paper, owing to its higher puncture resistance for a given thickness, but experience with working pressures above 22,000 volts is so limited that we must wait for some time before any definite conclusions can be reached.

As the result of some fifteen years of experience with underground cables, the following table, giving thickness of insulation and lead sheath for various sizes of conductors and working pressures is submitted as representing conservative practice:

Table No. 1—Paper Insulation.

Standard Working Pressure of 3000 Volts.

No. 6 to No. 2 B. & S......	5/32"	5/64"	3/32"
No. 1 to No. 00...........	5/32"	3/32"	7/64"
No. 000 to 300,000 c. m....	6/32"	7/64"	9/64"
400,000 to 750,000 c. m.....	6/32"	7/64"	.....
800,000 to 1,000,000 c. m...	7/32"	4/32"	.....
1,250,000 to 2,000,000 c. m..	8/32"	9/64"	.....

For each 1000 volts increase of pressure above 3000 add 1/32 inch insulation to the wall until 11,000 volts is reached and after that add 1/64 inch for each 1,000 volts. If 35 per cent para rubber compound or varnished cambric is used for insulation, this empirical rule may be changed to read: For each 1,000 volts increase above 3,000 add 1/64 inch insulation to the thickness of wall until 25,000 volts is reached.

For the insulation of low potential cables in Class II, 4/32 inch paper should be used on all sizes up to 1,000,000 c. m., and from 1,250,000 to 2,000,000 c. m., 5/32 inch should be used.

From a purely electrical point of view, one-half of this insulation would be ample to withstand 650 volts working pressure, but the mechanical effects of reeling and unreeling the cable and pulling it into ducts and bending around the manholes, are to practically destroy the insulating qualities of the layer of paper next the lead, so that we really start in with a cable having approximately 1/32 inch of its insulation destroyed before it is put into service; this mechanical destruction of insulation is especially marked in cold weather, as the oils used with the paper tend to congeal when subjected to a temperature below 32 degrees F. The cable manufacturers have met this difficulty by using more fluid oil, with the result that the insulation resistance of the cable may not be more than 50 megohms at 60 degrees F., but by the use of this very soft insulation they have produced a cable giving a very low insulation, but a high puncture test and at the same time have met, to a great extent, the difficulty of handling paper cable in cold weather. It is always advisable, however, if a cable is to be used in a temperature below 32 degrees F., to keep it in a warm place, such as a boiler room, for at least twelve hours before drawing it in. The cable may then be used in the coldest weather, as it gives up its heat very slowly.

Class III cables have, up to within the last three years, received very little attention, as, in almost every case, bare copper cables were installed. But a closer study of the electrolysis problem indicates that in many instances the use of insulated, negative cables would eliminate a great deal of the trouble and damage to cable sheaths, etc. When electricity leaves a conductor in wet or moist ground the water in its path is decomposed into its constituent gases, having the chemical symbols H_2O, and oxygen has an affinity for almost all metals, forming an oxide of iron or oxide of lead or copper, as the case may be, slowly but surely destroying the metal. A pressure of two volts is sufficient to decompose the water, so that the ordinary negative drop of from 5 to 25 volts possesses ample possibilities in the way of electrolysis, if not properly taken care of.

In the ordinary location of direct current power plants in our smaller cities, only one generating station is used and sufficient positive copper is installed to give the necessary potential on the trolley, the negative or return circuits being taken care of by the track rails up to the nearest point to the power plant or substation, and from this point bare negative feeders are used to conduct the current back to the grounded negative bus in the station. The maximum amount of copper installed in this negative rarely equals that used for the positive, so that in all probability there will be at least five volts drop from the nearest track rail to the negative bus, and if longer, bare negative feeders were used running to the various points of heavy traffic, the drop on them will be at least 4 per cent, as the financial burden caused by interest on capital invested becomes too great if a smaller drop than this is used. We thus have bare negative feeders with a potential of from 5 to 25 volts on them, running parallel to our positive and high tension feeders, as well as our neighbors' cables, gas mains, water mains, etc., and a few had rail bonds may increase this drop several per cent.

The negative feeder may, therefore, be looked upon as an infinite number of smaller battery cells coupled in series with their negative pole coupled to the negative bus in the power house or sub-station, and their positive coupled to the track rail, with some good and some bad connections all along the line to the various lead sheaths of the cables running near them, as well as to gas mains, etc. If the connection between one of these imaginary cells and a lead sheath be sufficiently good, then this battery's potential of perhaps 10 volts will be on the cable sheath and will cause a current to flow from it at some other point along the line where the negative return is at a lower potential. At the point where the current leaves the lead sheath, electrolysis will occur, and in time the feeder will break down from the moisture admitted through the perforated lead sheath. These conditions obtain to a greater or less extent in all systems having bare negative returns and grounded negative bus bars, no matter how many sub-stations may be in use.

An obvious remedy would seem, at first sight, to be the bonding of the lead sheaths of all feeders to the bare negative cables at frequent intervals, but this introduces another trouble which may be as serious as electrolysis. A short-circuit in a positive feeder, to ground, will cause an enormous current to flow through the lead sheaths, and, in all probability, burn off the bonds and destroy the lead sheaths in a number of cables. Instances of this have occurred to the author's knowledge, in which the lead sheaths have been completely burned off for 400 feet on cables that were entirely innocent of the origin of the trouble.

Another source of trouble, due to the use of the grounded negative bus and bare feeders, is in the other feeder's lead sheaths carrying the negative current back to the power house or sub-station by an entirely different route from that taken by the bare negative feeders, with the result that this return current leaves these lead sheaths, either in the power house through a ground put on them or through some accidental ground, such as a cable hanger in a manhole. Every time a short circuit comes on the system a rush of current will flow through these lead sheaths and perhaps puncture small holes in the lead.

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*Presented before the American Street & Interurban Railway Engineering Association, Columbus, O., October 16, 1906.

The most satisfactory solution of these problems of avoiding electrolysis and saving the lead sheaths from destruction seems to be in the use of an insulated negative bus in the power house and sub-station and insulated negative feeders right up to the track rails. For this purpose the negative feeders should preferably be insulated with some material which does not require the use of a lead sheath. Several types of insulation are now on the market, which promise to be very satisfactory for this purpose, as the potential carried by the negative feeders is quite low.

The ideal solution of the problem would be found in the use of the feeders without lead sheaths, and some very satisfactory tests are now being made on experimental lengths of 650-volt cable of this type, but it does not seem probable that any cable can be constructed at present which will safely stand being drawn into wet ducts and manholes and used continuously on pressures above 2,000 volts without the protection of a lead sheath to keep out the moisture.

By using insulative negative feeders and avoiding all grounds in the power house or substation, it is evident that there will be little or no tendency for the return current to leave the track rails, if properly bonded, and absolutely no tendency for stray currents to come back to the powerhouse or substation by way of lead sheaths, gas mains, etc., thereby relieving us of probably 75 per cent of our present electrolysis troubles.

Coming back to Class II cables, the safest plan seems to be to insulate the lead sheaths of all feeders by supporting them on racks having some form of insulation between the lead sheath and the hanger. All cables should also be wrapped with two layers of 1/8-inch asbestos in every manhole where more than one cable is on each side, in order to afford protection from an arc caused by any one of them burning out. In perfectly dry places this asbestos wrapping can be secured very neatly by applying silicate of soda to it, the soda in itself being a good protection against fire; in the average damp manhole this soda will soon loosen and the asbestos wrapping will fall off, so that, in this case, a galvanized steel tape about 5/8x1/32 inch should be used to hold the asbestos in place.

In order to get early warning of the breaking down of any positive feeder and so give time to have it cut out before doing any further damage to itself or neighbors, a small insulated wire (say No. 14, B. & S.) should be connected to the lead sheath and brought up to a panel where the switchboard operator can see it. On this panel may be mounted one or two lamps for each positive feeder and these lamps connected to ground through a resistance large enough to limit the current to the amount necessary to light the lamps when the pilot wire attached to the lead sheath to any feeder becomes alive through the grounding of that feeder on its insulated lead sheath. Ammeters or relays operating a gong may also be used with advantage for this purpose at a very small cost per feeder.

In reference to Class I, or high tension three-phase cables, their lead sheath should be insulated and wrapped with asbestos in the same manner as described for Class II, with the additional precaution that their lead sheaths should all be bonded together and grounded in the generating plant. The neutral, or star point, of the generators or transformers should be grounded through a resistance of such dimensions as to limit the current, flowing through it when a ground occurs on a high tension feeder, to the amount necessary to trip the overload relay. For example, on a large installation using 11,000 volts for distribution to its substations, the neutral connection is one having resistance of six ohms and a carrying capacity of 1,000 amperes for one minute. As the Y potential to ground is 6,300 volts, this limits the current to a maximum of 1,000 amperes when a feeder grounds. This system was adopted after some rather disastrous experiences with short circuits on high tension feeders and has been in successful operation for over a year.

When a high tension cable breaks down, it almost invariably goes to ground from one phase only, and then, after the charging current of the whole system has been flowing to ground through this fault for perhaps 10 or 20 minutes, the insulation of the other phases is burned off, so that a short circuit on two or three phases occurs, with the result that either the whole system is shut down, due to the sudden fall of potential to perhaps one-fourth of its normal value, or at least one or two substations are shut down from the same cause. With the neutral grounded through a suitable resistance, the oil switches, on the grounded feeder only, trip out quietly without any disturbance whatever to the rest of the system.

If the three-phase high tension cables are not grounded in the generating plant, the burning out of a cable will puncture the lead sheaths at a number of points, possibly a thousand feet away, as it is obvious that the current must leave the lead sheath somewhere, and the easiest path is usually found at the cable hangers in the manholes. This will be true no matter whether the neutral is grounded or not.

As a further precaution, it is advisable to bond the lead sheaths of the alternating current feeders quite frequently in the manholes by wiping on a lead strap, say ⅛x2 inches to the lead sheaths. Bonding by wrapping the lead sheaths with a few turns of copper wire is worse than useless, as the copper wire, if put on tight enough to make a good connection, may cut through the lead, and if not tight enough to do this it will probably make such a poor contact as to arc when current passes.

In conclusion, the author wishes to state that, in his opinion, at least 75 per cent of cable trouble is caused by defects in the lead sheath and not by defects in the insulation. Examine the ordinary vitrified duct and you will find that the inside, in all probability, contains several small, hard sharp points projecting from 1-16 to ⅛ inch; what happens to the lead sheath of a cable when it passes over these projections? A groove is cut in it in exactly the same way as by a tool in a planer. The result is that a little extra pressure, caused by a kink in the cable, will cut through the lead and admit the moisture, which, sooner or later, will destroy the insulation.

Outside of trouble in joints caused by carelessness on the part of the jointer, practically all cable trouble can be eliminated by the more careful choice and installation of conduits, by a very careful inspection at the time they are laid and by the use of cutters and cleaners after they are laid.

Lastly, do not try to get a low price on a cable by reducing the thickness of the lead sheath, as the integrity of the lead sheath is fully as important as the quality of the insulation, and the life of the latter is wholly determined by the degree of perfection obtained in excluding moisture from it.

ECONOMY IN CAR EQUIPMENT—WEIGHTS AND SCHEDULE.*

BY E. H. ANDERSON, SCHENECTADY, N. Y.

The intent of this paper is to deal with the dynamic features of car service and its relation or effect on the cost of that service. It is not to be expected that the values given apply accurately to all or any railway system, but serve to illustrate the effect of the dynamic on the economic.

By close examination into the service it may be possible to rearrange the equipment, speed and size of cars actually to give to the public a greater schedule speed at a decreased cost per car or passenger mile. Since the real profit depends upon a small portion of the difference between operating cost and money taken in, it is worth while to closely investigate to see if a small saving cannot be accomplished and thereby largely increase the real profit.

Figure 1 shows, in the usual form, the characteristics of a standard 40-horsepower railway motor. The gear is such as used on city service cars. The rating of the motor is 72 amperes. In starting the car usually this rating of 72 amperes is taken per motor, giving a tractive effort of approximately 1,400 pounds. Assuming an 18-ton single-truck car, loaded and equipped with two of these motors, the tractive effort per ton will be 156 pounds, deducting friction, say of 20 pounds, gives an accelerated force of 136 pounds per ton, equivalent to 1.5 miles per hour per second increase in speed.

Theoretically this rate of acceleration is continued by various connections of controller until the full voltage is applied on the motors, the speed of car at that time being 10.25 miles per hour. The motors then accelerate on the automatic characteristic of the motor, and the speed increasing and the tractive effort decreasing, until the tractive effort is sufficient to overcome only the friction of the car, the car then continuing at this speed until power is shut off or brakes applied. This maximum speed will occur when the tractive effort, assuming friction 20 pounds per ton is 180 pounds per motor. By reference to Figure 1 it will be seen that the speed at this tractive effort is approximately 20 miles per hour on 500 volts applied to the motors.

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*Presented before the American Street & Interurban Railway Engineering Association, Columbus, O., October 16, 1906.

Figure 2 shows graphically the speed and energy operation of an 18-ton car equipped with motors having the characteristics as shown in Figure 1.

The abscissae are time in seconds, and the ordinates speed in miles per hour, and kilowatt input of car. It is evident that the area enclosed by the speed-time curve is the distance traveled by the car, similarly the area of the kilowatt-time curve is the energy taken to propel the car over the particular distance in the particular time.

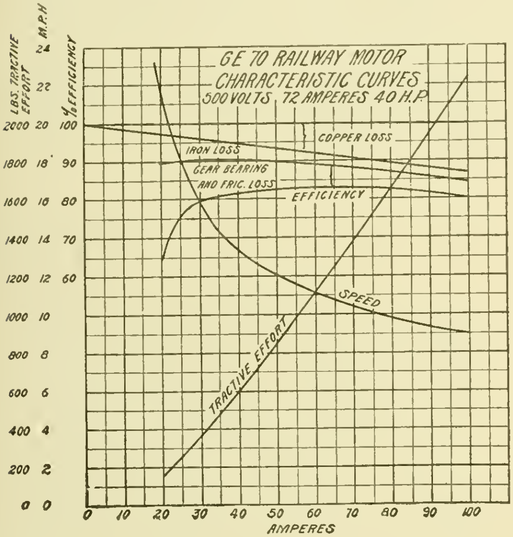

FIG. 1

Figure 3 shows the operating characteristics of the car referred to, with various distances between stops.

The abscissae are distances in feet between stops, the ordinates being miles per hour schedule speed, watt-hours per ton-mile and average input per ton.

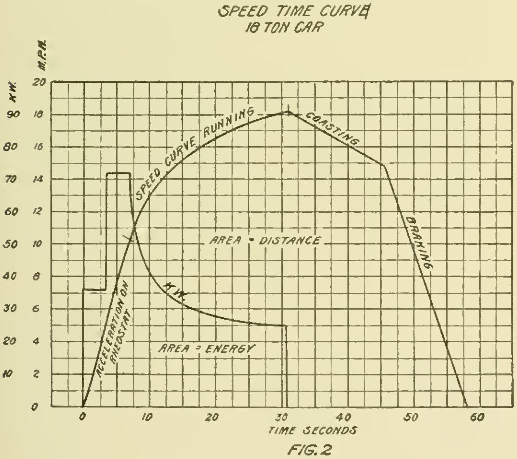

FIG. 2

By reference to Figure 3, we find:

With 800 feet between stops, schedule speed is 10.4 miles per hour; watt-hours per ton-mile, 131; average kilowatts input per ton, 1.35.

With 3,000 feet between stops, schedule speed is 15 miles per hour; watt-hours per ton-mile, 88; average kilowatts input per ton, 1.33.

With 4,000 feet between stops, schedule speed is 18.2 miles per hour; watt-hours per ton-mile, 68; average kilowatts input per ton, 1.25.

These figures show the usual decrease in watt-hours per ton-mile and increase in schedule speed as the distances between stops are greater. The point to which attention is directed is that with a great variation in the distance between stops, the average input per ton is constant. Thus on long distance runs the cost of power per car-mile is reduced in the same proportion as the schedule speed is increased.

In all the foregoing a normal accleration of 1.5 miles per hour per second was used, and the speed characteristic as shown in Figure 1.

Figure 4 shows the energy and power for a constant schedule over a constant distance of 1,000 feet, the variation being in pounds per ton for acceleration.

At 70 pounds per ton for acceleration, the horse-power rating of motors per ton of car is 2.7, and the energy 102 watt-hours per ton-mile. At 150 pounds the horse-power rating of motors per ton of car is 3.4, energy 85 watt-hours per ton mile. At 200 pounds per ton for acceleration, power 4.1, energy, 83.

There is a saving in energy from 102 to 83 watt-hours per ton mile by changing from 2.7 to 3.4 horse-power per ton. By reference to Figure 4, it will be seen that higher forces for acceleration than 150 pounds per ton increase the horse-power rating of the equipment without really making any substantial decrease in energy required. With an acceleration force of 100 pounds per ton, while the size of the equipment may be decreased some, there is a material increase in the energy required to operate the car.

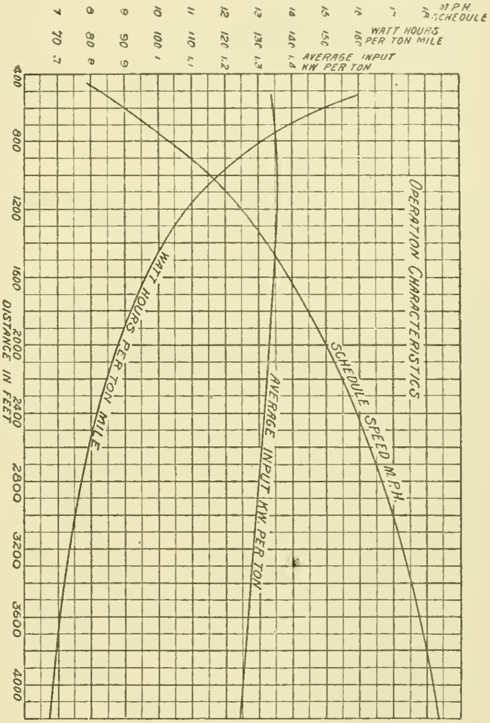

Figure 3.

Figure 5 shows the horse-power per ton and the energy required to make various schedule speeds over a definite distance.

Making an 8 mile per hour schedule, the power rating is 1.8 horse-power per ton, and the energy 72 watt-hours per ton-mile. Making a 10-mile schedule, the power rating of motors is 3.25 horse-power per ton, energy 94 watt-hours per ton-mile. Making a 12 mile per hour schedule, power rating is 6.7 horse-power per ton, energy 135 watt-hours per ton-mile.

By inspection of Figure 5 it will be seen that the power and energy increases at an enormous rate between a schedule speed at 12 and 13 miles per hour and becomes very large as the limit of physical possibility is approached.

Figure 6 shows the effect of accelerating with a force of 100 pounds per ton, as compared with 150 pounds per ton.

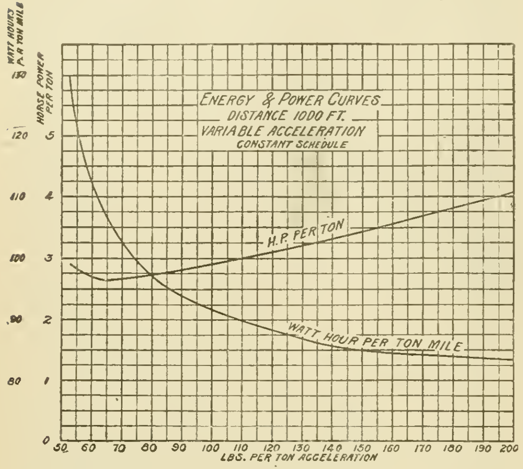

FIG. 4

By examination of the curves it will be seen that the energy input per ton is smaller, and the schedule speed higher with 150 pounds per ton. The equipment, car weight and conditions, are identical in every respect, and while the difference may seem small at first, it is well worth serious consideration.

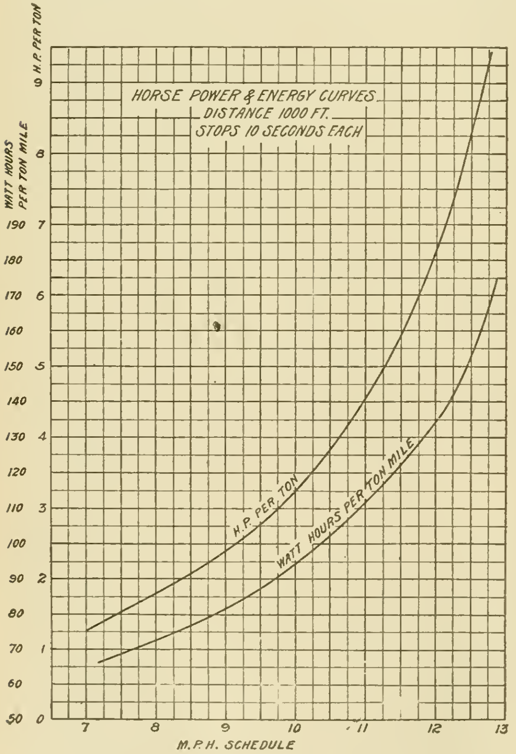

FIG. 5

With 800 feet between stops, the schedule is 5 percent higher and the energy 1 or 2 percent less with the acceleration due 150 pounds per ton; thus for the same ton miles there is a reduction of approximately 6 percent in energy, cost and wages of motormen, and conductor (platform cost) which in large systems is a very considerable item. The difference in favor of the 150 pounds per ton for acceleration becomes a greater percentage as the service is more and more congested, and the distance between stops less and less. Besides the saving indicated, a comparison of rate of acceleration points strongly to the kind of equipment to be desired. Because of ordinary street conditions, the coefficient of traction is much reduced as compared with the clean dry rail.

It is experienced that single motors on single-truck cars or double motors on double-truck cars are greatly hampered on small grades, and well nigh inoperative at times, because of the low coefficient of traction caused by slimy or snowy condition of track, the proper equipment is where every rolling point is a pulling point.

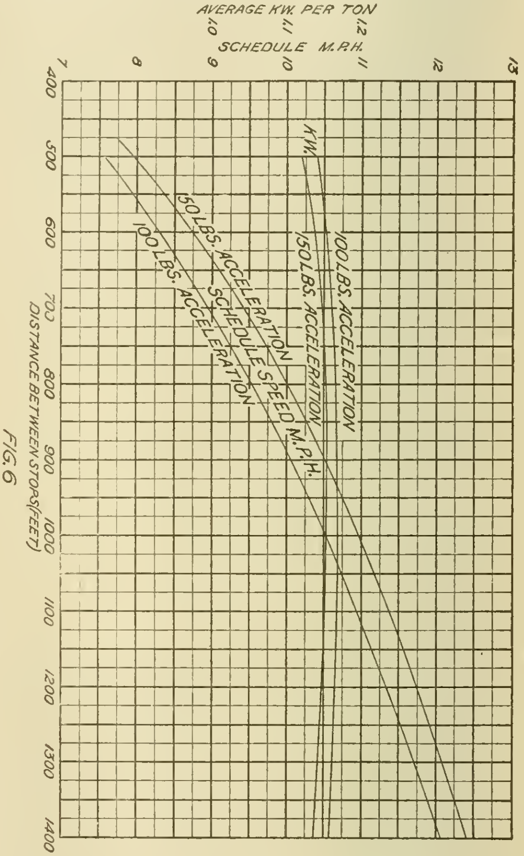

Figure 6.

Where all the track is on a private right of way, and the rails can extend above the surface of the ground so as to be kept clean, and grades are small, such as in steam railway conditions, half of the rolling points equipped as pulling points will be undoubtedly sufficient.

Figure 7 shows the effect of different speed equipment on the schedule speed and cost per car-mile. The schedule speeds are net, including 10-second stops. The cost per car-mile is based upon energy at 1.5 kilowatt-hour, 50 cents per hour platform labor, and $500 per car fixed charges. This latter being approximately ten per cent of the investment in the car. The costs which go directly as car-miles have been neglected, as they do not seriously affect the differences between the cost per car-mile for the various conditions.

The car has been assumed to be in service 12 hours per day for 350 days per year.

It is not to be expected that these curves apply to all or any one case, but serve to give a picture of the relations between cost per mile and schedule speed, with the different speed equipment and different distances between stops.

By inspection of the curves it will be seen that the cost per car-mile of the equipment for the maximum speed of 20 miles per hour is the same at 1,600 feet between stops as the equipment, which has a maximum speed of 24 miles per hour. The schedule speed, however, is 7 or 8 percent higher with the higher speed equipment. At 2,800 feet between stops, the cost per car mile is the same for the equipment, having a maximum speed of 20 miles per hour and 28 miles per hour, whereas the schedule speed is 18 percent higher with the higher speed equipment.

Examining Figure 7, at short distances between stops, it will be seen that the slightly greater schedule of the higher speed equipment is maintained at an increase of expense per car-mile. Evidently the better equipment is the one with the slower maximum speed, and as has been seen in Figure 6, the one of greater accelerating power.

Examining Figure 7 at 4,000 feet between stops, cost per car-mile is least with the maximum speed equipment at 28 miles per hour, while the schedule speed is decidedly higher.

It will depend upon the distance between stops, of energy and fixed charges, just what speed equipment will give the least possible cost per car-mile, by a little study and the facts in hand the proper speed equipment can be arrived at with considerable degree of accuracy.

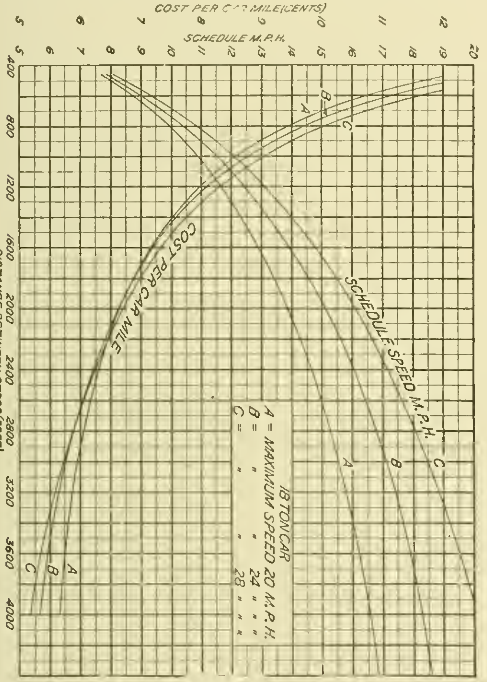

Figure 7.

By closely examining a composite service of city and interurban running it is also possible to determine closely the proper speed equipment for the combination service which will have the least cost per car mile.

Considering the curves in Figure 7, it will be seen that the cost per car-mile for short runs is high, whereas for long runs between stops the cost per car-mile is very much lower.

Should the earnings per seat-mile be approximately the same for the interurban cars as for the city car, the interurban railway should pay handsome dividends, whereas the city system will struggle for life.

Should the power cost be greater than that which I have assumed, the cost curves will be higher and cross at a greater distance between stops. Should the fixed charges, such as platform labor, interest, depreciation and taxes on cars and car houses be greater, the cost per mile will be higher, and the curves of cost will cross each other at a shorter distance between stops, thus making the higher speed equipment more necessary for the longer runs.

While these facts are in accord with common sense and experience, it is gratifying to see that the conclusion can be expressed in mathematical form.

For smaller cars the energy is smaller and the fixed charges the same; thus the cost per car-mile will be lower for the smaller car, but much higher per seat-mile, the proper speed for the smaller cars should then be high. Conversely, where the car is large the economical speed will be lower.

The above illustrates strongly that the largest car which can be run, and the proper frequency of cars maintained, will give the least cost per seat or passenger per mile.

RELATIVE ECONOMY OF TURBINES AND ENGINES AT VARYING PERCENTAGES OF RATING.*

BY WALTER GOODENOUGH, ENGINEERING DEPARTMENT STONE & WEBSTER BOSTON MASS

It has become evident to most of us, from time to time, that what is needed in the power station is not so much more economical prime movers, but rather more intensive operation of the particular type of machinery which we now have. This paper has, therefore, been written with the idea that it might bring interesting discussion from many and be of assistance to some of the companies.

The assumption that fixed charges are spread over the whole 24 hours, and that the machine operates during the full 24 hours is, of course, not correct; but in the present instance where it is desired to bring out, rather the effect of the combination of fuel and fixed charge costs, instead of actual operation costs, this assumption is considered to be well taken. On this basis characteristic curves for engine-driven and turbine-driven units are produced.

It is assumed for the purpose of this paper that each plant is of one unit running 24 hours per day, and on this basis fuel costs and fixed charges per kilowatt-hour are plotted individually and then combined. No other costs have been taken into consideration, as the addition or subtraction of such constant costs as labor, heat losses, etc., make little or no difference in the characteristics of the curves until these increases or decreases have assumed a very large size. It is further assumed that the labor costs for a single engine-driven unit will be fully as low as for a turbine, and this assumption has also been made for the maintenance of the respective machines. It is taken also that the extra heat turned into the feed water by turbine auxiliaries over those of engine auxiliaries will offset the greater amount of heat used in the work of driving the larger turbine auxiliaries.

In making the curve of fuel cost, the price of coal is assumed at $2.00 per ton, and the evaporation per pound of coal as 7½ pounds of water. On this basis, 1,000 pounds of water evaporated will cost 13½ cents.

In determining the fixed charges, the following percentages have been taken for engine-driven units:

Interest	5 per cent.
Depreciation	12 " "
Maintenance	1 " "
Taxes	1 " "
Total	19 " "

For the same charges for turbine-driven units the percentages have been taken:

Interest	5 per cent.
Depreciation	10 " "
Maintenance	1 " "
Taxes	1 " "
Total	17 " "

In this tabulation interest remains standard at 5 per cent.; the maintenance remains the same for both turbine and engine, as any good engine unit will not have a higher maintenance of itself and its auxiliaries than a turbine with its much more numerous auxiliaries. In considering depreciation, amortization has been neglected, and the depreciation deliberately placed high.

In the present state of the art we can expect to see developed in the near future prime movers and fluid generators (including the pieces of apparatus now known as boilers and gas producers) of such an increased efficiency that it will become necessary, for many reasons, to abandon our present units within a few years. We are assured by the makers of turbines that they are still exploring the field, and most of us have visions of high-economy gas-driven machinery at no distant date. So unsettled are the conceptions for the future of commercial economy in power generation that it cannot be but wise to place a high depreciation on our present machinery. Competition, local disturbances through municipal ownership, agitation and other commercial reasons will demand more than ever the supersedence of present-day designs for new ones of higher efficiency. The exact form in which "depreciation" is applied does not matter, the basic fact remains that machinery does depreciate, and the fact is not less true that the genus "stockholder" pays the depreciation. He may do it by default of dividends, held in a sinking fund by a careful administration, or by means of assessments, or interest on mortgages or bonds.

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*Presented before the American Street & Interurban Railway Engineering Association, Columbus, O., October 16, 1906.

In regard to the first cost of the machinery under discussion it has been assumed that with the 500 kilowatt units the system in use will be 500-volt direct current. It is also assumed that the engine units will have direct current generators, and the turbine units alternating current generators, requiring converting apparatus. It is further assumed that the engine will work with saturated steam and that the turbine will use superheated steam. We, therefore, assume the following costs for the engine unit:

Engine and generator	$45.00	per kilowatt
Condensing apparatus	4.00	" "
Foundations	3.00	" "
Total	$52.00	" "

On the same basis we assume that the turbine with saturated steam would cost as follows:

Turbine and generator	$36.00	per kilowatt
Condensing apparatus	6.00	" "
Foundations	1 00	" "
Motor generator apparatus and switchboard	22.00	" "
Total	$65.00	" "

In order, however, that full operating value from the stand-point of steam economy may be obtained from the turbine, it is necessary to install with our boilers some superheaters, and for this additional cost we should apply $4.25 per kilowatt, making a grand total for the turbine of $69.25.

In order to show the effect upon the combined kilowatt-hour cost of having to add converting apparatus, Curve D in Fig. 1 has been made, based on a total first cost of $69.25, less $22.00.

For 1,500-kilowatt units it has been assumed that both the engine-driven and turbine-driven unit will generate alternating current, and on this basis there have been assumed the following costs:

Engine and generator	$35.00	per kilowatt
Condensing apparatus	2.25	" "
Foundations	2.25	" "
Total	$39.50	" "

On the same basis as the above we have:

Turbine and generator	$28.00	per kilowatt
Condensing apparatus	5.00	" "
Foundations	.50	" "
Superheater and piping	4.00	" "
Total	$37.50	" "

In the case of curves for 1,500-kilowatt units, it has been assumed, without question, that the engine will run with saturated steam and the turbine with superheated steam.

On the basis of all-sized units, operating alternating current, the 500-kilowatt turbine makes quite a little better showing of rated load efficiency against the engine unit than the 1,500-kilowatt size of turbine. The author would, however, suggest that the 1,500-kilowatt unit is probably the one size where conditions of total cost per kilowatt, fuel and fixed charges come nearest those of the engine. For all sizes above 1,500-kilowatt the combined cost of the turbine unit draws rapidly away from the engine unit in the direction of lower cost, and it might be suggested here that if there were any one spot where engine builders desired particularly to apply refinements to their designs in the way of larger cylinder ratios, rejacketing, reheating and superheating, the 1,500-kilowatt size would undoubtedly prove the most fruitful for them. There is some question, however, as to whether the increased economies in steam consumption they might obtain would overcome the increased fixed charge cost due to greater expenditure to obtain these results.

As stated in the first part of this paper, it is of considerably greater importance in the immediate present to the station manager to consider how he may obtain the greatest economy from the units which he has, rather than where he can buy units having half a pound better steam consumption than what he has.

If we look at Figure 1, it will be noted that the fuel cost for the 500-kilowatt engine unit is at its lowest point at 90 percent rating, while with the turbine unit this best fuel cost comes near to the 120 percent rating, both with and without superheat. Now, if we add to this the fixed charges per kilowatt-hour, we see in our engine unit that the point of maximum economy is moved from 90 percent rating to 125 percent rating. Also, in our turbine units the point of maximum economy, when converting apparatus is included, is moved up to about 145 percent rating from 120 percent. When the converting apparatus fixed charge is not included, we find the high point of total economy has dropped back to around 140 percent.

From these characteristic curves, therefore, it becomes quite apparent that we cannot carry our steady loads per unit any too near 100 percent rating. It would not, of course, appeal to the average careful station manager to operate his individual units at continuous loads above 100 percent. Consideration has to be taken of the ability of the generator to stand continuous overload, and a margin has also to be provided for suddenly applied overloads or swings. It would seem, however, that there should be no valid excuse in a well managed plant for not maintaining the loads as near as possible to 100 percent rating of each individual machine. It is well known that engine builders have, for quite a number of years, built their machinery, for point of maximum economy, nearer to 75 percent rating than 100 per cent rating; they assuming that the loads in a station would always be under, rather than up to or over 100 percent; and, therefore, they have put their machinery where it would show up the best under loads which the average engineer feels he can run. It is apparent, however, from these curves that the true economy of the plant is by no means the steam economy of the plant, and it is also seen that the engine builder, on the basis of steam economy alone, did not shove his point of best economy far enough back, after all. On the other hand, it appears that the turbine builder has not yet reached consideration of this point, and he is building his turbine for a rating which carries the point of combined economy to considerably over 100 per cent rating and close up to the point where the total economy begins to fall off sharply, and the capacity of the machine is being rapidly absorbed.

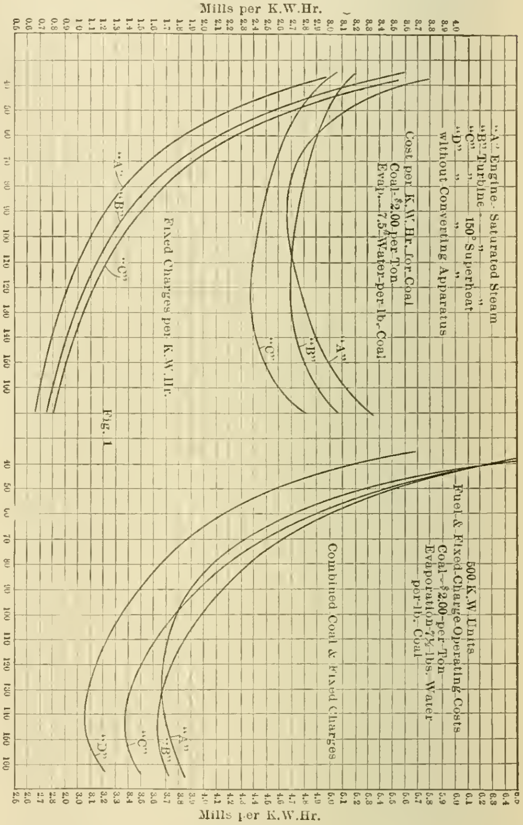

Figure 1.

In the particular instance of the 500-kilowatt units, it would seem that the engine overload capacity was not too far in excess of its generator capacity; but in the case of turbines it is apparent that the size of the turbine for the same size generator should be considerably decreased and means taken to insure, after such decrease, that overloads can be readily carried by the machine. Such changes as those would then bring the point of maximum total economy back to the place where it is actually possible to operate the machines under steady loads in the average power station furnishing current for a street railway.

However, the turbine builder has not supplied us with this very desirable machine, and it, therefore, becomes necessary for us to make the best of what we have. It would seem wise to fix as high as possible the loads at which each individual machine in the station should operate, and then maintain these loads as continuously as possible. When variations have to be taken they should naturally be taken by increasing the load on the machines already in service, rather than to put in another unit and underload it, or all of the units in service. There is a question of reliability and safety of service, which comes in here, and which the station manager will, of course, have to settle according to the character of his load and the number and size of his units.

The foregoing naturally brings up the question of selection of the size of units in new developments or renewals. The end of all construction should be the minimum combined cost per kilowatt hour of operation, and, therefore, it behooves us in selecting our new units that we study carefully not only the immediate loads to be applied, but also the expected future loads. It is to be suggested that many managers can, with good success, chart the daily load and fix almost precisely, from day to day, the time when each unit shall enter upon its work and the load which it shall carry. The average station engineer has too limited a view, from reasons of training, to take any initiative of this sort. He will often require considerable persuasion to get him over the fear of running his machinery too hard. It is the author's general experience, however, that with someone to start such a man authoritatively along the lines of better economy, that he becomes, not only anxious to make a better showing, but his pride in such showing is very marked.

The general statement which has been made that turbines have a flatter load curve than engines is decidedly misleading when considered from the standpoint of total cost per kilowatt-hour. Inspection of the combined curves on both Figures 1 and 2 show that at 100 percent rating the rate of change in cost per kilowatt-hour of operating the turbine is decidedly greater than for the engine. It is seen from this curve that the engine, with its point of steam economy at 85 percent or 90 percent rating, has at 100 percent rating a much flatter curve of total economy. If we will inspect Curve D, Figure 1, we will see that for an increase in load, from 75 per cent rating to 100 per cent rating, the increase in economy on the basis of which this curve is made will be 11 percent. Of this 11 percent gain in total cost the steam economy gain is only 4.7 per cent, while the fixed charge gain is 23 percent, or four times as much gain as in steam cost. These percentages, of course, will bear quite some changing under different conditions, but it must be borne in mind that the characteristics of the curves will remain very generally the same.

Again, as stated in the first part of the paper, it is not strictly correct to assume that the unit is to run 24 hours a day at a certain load. However, it should be noted that applying the fixed charges to the unit for the actual number of hours run each day will increase these fixed charges per kilowatt-hour, and more than ever increase the effect on the total combined economy, shoving the point of maximum economy still further up into the overloads. The decreasing of the fixed charges per kilowatt-hour means, however, an increasing of the steepness of the fixed charge curve below 100 percent rating, thereby accentuating from the other standpoint the marked effect upon total costs which fixed charges have at all ratings below 100 percent or thereabouts.

The effect of the increase in the cost of coal, while not affecting the strict character of the curve of cost per kilowatt-hour, does somewhat flatten out the inclined portions of the curve.

Thus it may be truthfully said that the curves A, B, C and D will at all times retain their characteristic forms, and that being the case, whatever has been shown in this paper as to relative costs for different percentages of full load is very closely true. The increase or decrease of either fuel cost or fixed charge cost changes but very slightly the relation of the individual fuel and fixed charge curves to the combined curve.

The point has been raised that, after a plant is once installed the fixed charges do not enter into the economy of operation, and that, therefore, the plant should be run at its lowest steam consumption. If, however, it is legitimate and necessary to figure fixed charges per kilowatt-hour in preliminary estimates, it appears to the author that they should be considered when the plant is in operation, for two reasons.

First—The operating reason, that with the load usually carried by operating engineer, full value is not being obtained from the investment. A monthly report which shows fixed charges per kilowatt-hour generated should be of immense value to the operating superintendent in determining whether his plant is receiving the particular and discriminating attention which such a large investment warrants.

Second—The investment reason, that a machine which has the lowest combined cost per kilowatt-hour at the individual loading that is carried, is the most desirable to continue in the installation. Manifestly a machine which has a combined kilowatt-hour cost lowest at 100 per cent rating is better than one having its lowest cost at 140 percent rating. The first machine will probably have a smaller steam end for the same generator than the second unit. By adding automatic overload devices, costing little money, to the first machine it can be made to operate up to the full overload capacity of the generator in taking care of peaks of short duration.

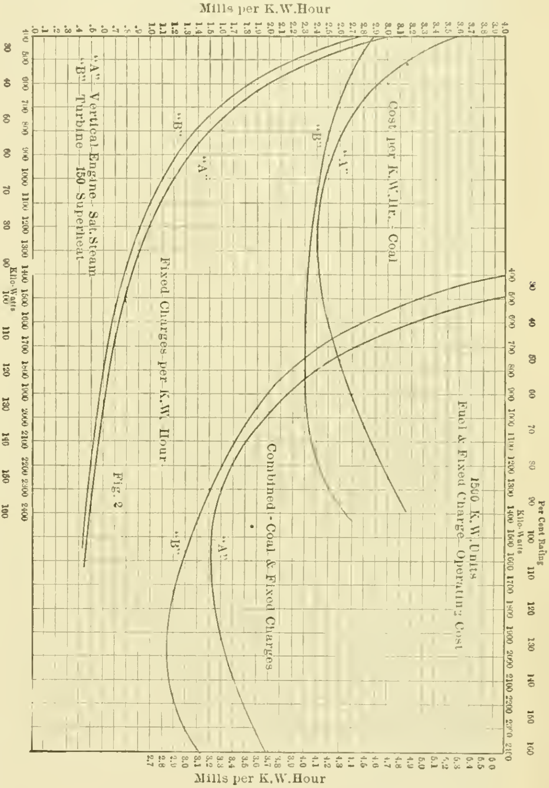

Figure 2.

The author would point out that this is not a consideration of station load factors, but rather a consideration of the economy in operation of individual units, and also economy in their selection as affected by type and design.

In conclusion, the author would additionally point out that the gains indicated herein for turbine and engines are, to a greater or less extent, true for all other station apparatus, and perhaps no more true than in the case of boilers whose load and operation seem equally as far buried under misapprehension as are the generating units.

The government of Ecuador, South America, has asked for bids for a steam or electric railway from Ambato to the river Arajuno.

WHICH IS THE BETTER POLICY, "QUICK OR DELAYED SETTLEMENTS?"*

BY A. J. FARRELL, CLAIM AGENT INTERNATIONAL RAILWAY CO.

There are several classes of accidents that occur on surface roads that are cases of clear liability, such as collisions between cars, cars leaving track, starting of cars when passengers are boarding or alighting, blowing out of controllers. There are several others, but these are the principal ones and generally the most expensive.

"Rush or delayed settlements"—which are the better or most profitable for a company to follow? This can be answered both ways, for there is a great deal to be said for quick settlements and much, too, can be said for delayed settlements.

When an accident happens, such as a collision between cars, this is a case of clear liability and every person on either car can make a claim for injury or shock. The better way, after an accident of this kind occurs, is to see these people or as many of them whose addresses you have and you can find, and if their cases can be disposed of for a fair sum this is the policy that should be pursued. It is much cheaper to settle cases immediately after the accident, where it can be done, than to wait or delay such settlement. The sooner settled, the cheaper it can be done. These quick and fair settlements are almost without exception with people who have but slight injury or slight shock, and they are especially advisable, because such injuries, in a great many cases, are liable to multiply with age or time, especially if you are unfortunate enough to have people who are looking to get something for nothing, and there are a great many of them at the present time. But it is only the slightly injured or shocked that can be settled with at time of accident or shortly after. Only a portion of them can be settled with, and sometimes a small portion, for people exaggerate their injuries, and very generally ask more for the settlement of their claims than it is policy for a company to pay.

What is the result? The case is given into the hands of an attorney. It usually takes from one to three years to bring the case to trial in New York state for an amount of $500; and this is a long wait for a slight or an imaginary injury and it is hard to work against nature. When a case is tried, if tried, your claimant is looking better than when the accident happened and he has nothing but subjective symptoms to offer and they are not often taken seriously by the court or jury. So your chances are as good, if not better, than when you started out; and I would say that, nine times out of ten, you can make a much better settlement with this kind of a person through the attorney than you could at first with the claimant.

To illustrate: In the spring of 1903 we had a head-on collision between two cars that were going in opposite directions. One car took a switch and both cars came together with considerable force. A passenger on the north-bound car (a man who held a prominent position with a steam railway) claimed to have been seriously injured, and at no time could we talk settlement with him for any sum that was within reason. The best offer of settlement we could get from him was $5,000. He brought suit against the company for $25,000. The case was tried; the jury brought in a verdict of "no cause for action." The cause of this was that when the case was tried this man was the picture of health, and all his complaints were subjective symptoms and were not taken seriously by the court or jury. This is only one of a large number of cases that are dealt with in this way by this company, but time and space will not permit of more illustrations.

A person bringing an action against a railway company, no matter how clear his case may be, has to show some injuries before he can get any large sum. It is well to settle, if it can be done fairly and in justice to passenger and railway company; if not, it is cheaper and a better plan to dispose of such cases in court. By being afraid because this party has a clear case and settling, although you know that the person is unreasonable in his demand, you work by such a settlement an injustice to your company and to yourself and create a bad example for others in the same accident or in similar accidents. It has been my experience that when people get more in a settlement than is justly due them they are very fond of talking and telling their friends how they "did up the railway company;" and this often works against you later on; you are told how much you paid such a person and how slightly he was hurt.

Is it safe to make quick settlements with seriously injured people, if it can be done? This is sometimes done, although not often; but is it good policy? Suppose you settle a claim with a person who has serious injuries and you make the settlement within a short time after the occurring of the accident and the sum paid to this person is a small one; what is usually the result? The person presents another claim or you have to defend a lawsuit, and what is your defense? You put in your release. What does the claimant say about the settlement? That at the time he or she did not know that it was a settlement; thought that the money paid was for current expenses or denies signing it at all or claims that he was under the influence of drugs and in no condition to make a settlement. You may have witnesses to the signing of the release, but usually they are friends of the injured person and what do they say? Simply that they understood, as the injured person did, that the settlement was for current expenses or that the person was not in proper condition to make a settlement. Where is your release?

To illustrate: Some eight years ago a driver of a cab came into collision with a car and his right leg was caught between the forward part of the car and the cab, seriously bruising his leg. He was taken to the hospital. The writer went to the hospital the next morning; settled the case for a small sum, the doctor and two nurses signing the release as witnesses. Some week or ten days later the leg was amputated above the knee. This man brought another claim. What was the strength of his claim? That when he made the settlement he was in no condition to do so, as he was under the influence of drugs; and the doctors and nurses, though friendly with the company, could not conscientiously go on the stand and state that the man was not partly under the influence of drugs. What was the result? The company was forced to pay, in my opinion, a much larger sum to settle than would have been done if the case was not settled so soon after the accident.

So that usually only the people who are slightly injured are the ones that can be settled with at time of accident or a few days after; the people who are seriously injured can only be settled with after they find out how seriously they have been injured or after consulting their physicians and friends. This is certainly right. No person with ordinary common sense is going to settle his claim for less than he deserves, knowing that the claim is gilt-edged; and it comes to this: Can the person get more money that he can call his own by settling with the company direct and getting his money quick? If this is for his best interest, then you can settle with him, and not otherwise.

Take it to yourself or one of your family. Suppose they were injured on some steam or other surface road. Will you settle or are you going to let them settle for a small sum and before they know how their injuries are going to affect them in the future? I don't think you are and I don't think that any smooth-talking claim agent or adjuster can talk you into doing something that is against your own interests and common sense. People who ride on street cars are not such fools, and this empty talk of claim agents and adjusters, who tell their management and others in authority that they have settled with a person who has a broken arm for $25 or $30 and a person with two or three broken ribs for $30 or $40 and another person with a compound fracture of the leg for $60 or $70. This is all rot and the claim agent or adjuster who takes the release is either deceiving himself or his employers or the person settled with is insane, as the doctor bill in any of these cases would be as much as or exceed the amount paid. You may, and often do, make a good settlement, but the other side also makes a good settlement. You must expect this.

A man insures his house or furniture; he has a fire. What is the first thing he does? After the fire is out he gets ready for the adjuster and sees how high a price he can put on each article. Have you ever been there? If so, you know what you have done and how you did it. Your conscience may have pricked you a little, but you saw the dollars in sight. So with a person injured. As soon as the first excitement is over, what does he do? The same thing; and it he does not know how he will find plenty to tell him. Sometimes friends will help in making the settlement, but this is not often. Sometimes the physician advises settlement, but this is all done for a purpose, the doctor for his pay and future favors and his friends for ready cash.

Every case your company wins in court has a check on people who are anxious for lawsuits; and if they hear of the result of trials (which they generally do, as cases of this kind are given a great deal of notoriety through the press and talked of generally among people), they are not so apt to rush to an attorney to sue or collect their claim, but will go to the claim department and try to effect a settlement, which is usually done; and the same is beneficial to both parties; or, in other words, the claim department only pays for the settlement of a claim what they think is fair and just; and the same can be said of the majority of attorneys who have cases that have been sued or cases that have not been sued —they will write to you asking for a settlement of their case or go to the claim department and usually an adjustment of their case can be made. No attorney wants to take a case in court and try it and be beaten; though it often happens that we settle cases after all interested parties are in court, and often when the jury is drawn and the case partly tried and at a less or the same sum than had been offered for settlement of case and rejected. My experience has been, the more successful your attorneys are in court, the more successful the claim agent or claim department. The secret of effecting close settlements and the keeping down of the number of lawsuits is largely due to the success of your legal department in court.

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*Presented before the American Street & Interurban Railway Claim Agents' Association, Columbus, O., Oct. 16, 1906

The different localities and different classes of people make a great difference in the settlement of cases. The ordinary person is much easier to settle with than the highly educated. At least this has been my experience. What I have said, therefore, has had reference to the average class which patronize the street railway.

You see, then, that there is much to be said, both for quick and for delayed settlements, and I have tried to state the reasons for each and the objections to each. But, in my judgment, the whole matter comes down to this: Make a quick settlement if it can be fairly and reasonably made. If the claimant is unreasonable, do not be afraid of delay, for if the claimant is asking for an unreasonable amount the lapse of time will prove better than any medicine to bring him to reason; and the reasonable settlement is, in my judgment, the best settlement, whether made with a rush or after a delay.

THE POLICY OF THE CLAIM DEPARTMENT TOWARD THE PUBLIC.*

BY F. W. WEH, CLAIM AGENT, CLEVELAND ELECTRIC RAILWAY COMPANY.

The attitude of a street railway claim agent toward the public is important, not only to his own success in his chosen calling, but in its effect upon the earnings of his company. A course may be adopted whereby he will, in a short time, get the public "by the ears"; or, he may without losing a particle of his self-respect, so operate his department as to command the confidence of the people. The expenses of his department form the true barometer as to which method of operation has been adopted.

That a strong prejudice exists against corporations, and especially street railway companies, cannot be questioned. Why is it that the ordinary jury is predisposed to find undisputed facts, almost without regard to the evidence, against the railroad companies? They almost entirely disregard any conflict in testimony and limit their deliberations to the assessment of damages; the duties conferred upon them are most flagrantly abused everywhere. There may be several reasons for this predisposition on the part of the juries. In the first place, they are generally composed of men who are not wealthy, and they may feel that the corporation has grown wealthy improperly at the expense of the people. Then, again, the corporations are greatly misrepresented by persons who seem to think it to their interest to misrepresent them, and while such persons go through the country misrepresenting corporations, abusing and accusing them of all kinds of offenses, there is rarely any person ready, or prepared, to refute the false charges. And, further, a great deal of the feeling against corporations has been created by the treatment of the public by street railway companies. They have, in too many instances, stirred up bad feeling and strife, and a desire to kill off, rather than a friendly feeling to encourage and to keep alive.

Here is the field for the accomolished claim agent. Promptness and fairness in adjusting the grievances of the public will command its respect, if not for your company, at least for you personally. The claim agent cannot turn the tide himself, but he can do a great deal toward it. He meets the public more than any other officer; he meets not only the persons having claims, but their friends, their doctors and their lawyers; he meets the witnesses to each particular accident, and each accident widens his acquaintance and influence; he meets all classes of people, rich and poor, native and foreign born, honest and dishonest. He must know how and when to reach them all, and to accomplish the best results not only for the time being, but for the future, and for the benefit of his company. Tell them of some of the unjust claims and "hold-ups" he has to deal with; show them that the company contests claims not from a desire to shirk its just obligations, but because injuries are greatly magnified and values increased with the hope that the company will pay rather than submit the matter to a jury; how claims are built up and manipulated by "shyster" lawyers and "shyster" doctors as well; and how the lawyer boasts that it is only necessary for him to "push the button" and the jury "will do the rest"; recount some of the frauds which are practiced against the company; and when a meritorious claim is presented endeavor to make a settlement fairly satisfactory to all parties, so that the claimant will go away with a friendly feeling towards the company. He will tell his family and friends of his experience; they, in turn, tell others, and soon the company will get the reputation of being fair and contesting only claims in which there is no merit, and judges and juries will become cognizant of this fact. The claim agent must, wherever possible, engender a good feeling for his company; he must bear in mind that every friend made on behalf of his company will rebound sometime, and to some extent, in its favor. A sharp trick today in making a settlement may cost more some day later in settlement with some one of whom that practice has made an enemy.

The claim agent must be shrewd, and an excellent judge of character, so as to distinguish between fraud and honesty, frankness and cunning; he must always have his ax out for the rogue and impostor, for the people like fair play, and he can gain their confidence in no easier way than by exposing trickery and fraud.

One of the best attributes a claim agent can have in dealing with the public is an even and equitable temper; no matter how angry a claimant may be, no matter how insolent or insulting his attitude toward the claim agent, if he has a just claim, this fact should be taken into account and allowances made therefor, and the fact kept before the claim agent's mind all the time, that the interests of his employer demand a settlement of that claim. By not handling such claim properly he may drive the claimant to the courts, and make him such an inveterate enemy that no reasonable adjustment can be made of the case thereafter. The result may be a very large verdict which the company will have to pay, and that verdict may have a greater influence than in that particular case. I have frequently seen large verdicts rendered in damage suits acting for years as precedents for juries and the public in subsequent cases, to the great injury and damage of the defendants. I have in mind one particular county where certain meritorious cases were tried, and large verdicts recovered. That county, before that time, had no attraction to claimants of this character, but it has ever since those verdicts were rendered been the Mecca of persons who have damage suits against corporations. The mistake in not settling those cases has had its detrimental influence upon corporations in that locality ever since. So I say that when there is a meritorious claim, it may if not properly handled, be driven to the courts and the result be disastrous, not only in that case, but for many years to come. This is one of the things that a wise claim agent keeps in mind, and handles an irascible claimant with gloves, but with mind always intent upon a proper adjustment.

There is, unfortunately, a prevailing idea that the claim agent of a street railway company is the incarnation of everything that is dishonest; that he will resort to any trick, adopt any sort of imposture to take advantage of the unfortunate, and to settle just claims far below the proper amount that should be paid therein; that he is, in short, not a man to be trusted, for he will take advantage of any persons who puts his trust in him, a man who rides rough-shod over the rights of the people, especially the unfortunate who are injured, or who have a just claim against the company and justifies all his conduct by his endeavor to keep down the expenses of his department, a man whom society tolerates rather than takes pleasure in, knowing that he is a member thereof.

All this should not be. The claim department of a street railway company can be operated in such a way as to compel the respect of the public for the head of the department, and the claim agent should be able, by adopting a proper course with the public in the administration of his department, to acquire and maintain a position in society which is equal to that occupied by a member of any other calling; but it must be by adopting a course in which the public are justly and honorably dealt with. Every person who has a just claim against the company should be fairly treated; every one made to believe and feel that if he has an honest claim, he will secure justice at the hands of the claim agent. The influence which the claim agent exerts must lead the claimants to come to him, rather than to drive them to lawyers and to the courts.

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*Presented before the American Street & Interurban Railway Claim Agents' Association, Columbus, O., October 16, 1906.

It is not always, but it is generally true, that a meritorious claim can be settled on more favorable terms directly with the claimant, and before suit than with a lawyer after suit. The claim agent's organization must be perfect; no accidents must go without immediate investigation by competent, careful, intelligent and honorable investigators.

Street railway cases are usually determined upon facts. If a claim goes into litigation, a careful investigation will either win the case or tend to reduce the amount of damages. In negotiating for a settlement a carefully prepared statement of facts is a strong lever in forcing favorable terms; and not only this, but the claim agent is thereby enabled to correct some erroneous impressions of the claimant, and he is made to realize the fairness of the adjustment, and when the terms are finally agreed upon, he feels that he has been properly treated. Always endeavor to establish the absolute truth by your investigation. It is a false presumption for any claim agent to build up a fictitious defense for his company upon facts which cannot be substantiated in court. He may think that he is making a record for himself, but he is only building up a disastrous monument that will fall upon him with force and redound, not to the benefit, but to the disadvantage of the company he represents.

A part of the claim agent's duty towards the public is to reduce accidents as much as possible. While it is not within the province of the claim agent to formulate rules which he may think proper for the prevention of accidents, it is due to the public and the company he represents that he call the attention of the proper officers to the causes which make considerable disbursements in the settlement of damage claims necessary. Nothing brings to the attention of the operating department more forcibly the result of some negligent method in operation than the law of averages. Careful statistics should be kept of the number and kind of accidents, and the extent and character of injuries. I attach to this paper some forms which are used by the company with which I am connected—The Cleveland Electric Railway Company—which may interest some of you. Every negligent method corrected, every accident and injury avoided, is a benefit to the public as well as to the company. No greater duty rests upon the claim agent than to keep pounding away in opposition to negligent methods of operation, for, in the correction of any of these methods of operation, he is bestowing not only a benefit upon the public, but upon his employer as well. It is common to find rivalry existing between officers of a railway company, and you may be silenced by a sheer force of influence of the department against you. But the man who is easily rebuffed, who, when he knows he is in the right, can be turned aside because some superior officer disagrees with him, has no business to be a claim agent. He should be made of sterner stuff or he will lose all independent thought and fall rapidly into the role of a mere automaton. No management should be so narrow and conceited in its method of operation as to be unwilling to co-operate with the claim department in correcting faults from which both the public and the company suffer.

It seems to me that a great many of our companies have reached a stage of perfection; that is to say, we have about reached the limit of economy in the way of improvements to tracks and to rolling stock and the expeditious handling of passengers, and whatever is done to cheapen the cost of carrying passengers must be in the way of small economies. It is the little things in life that count; it is the little things which cause or prevent accidents. Here, it seems to me, is where the claim agent may properly step in, and by reason of the knowledge he has gained in the investigation of claims and his familiarity with decisions of the court in negligence cases, make suggestion for the prevention of accidents.

Bear in mind I do not favor an extravagant or reckless expenditure of money in connection with the claim department; nor do I favor a stingy or niggardly expenditure therein. I do not favor the expenditure of a single dollar for the settlement of any claim unless there is a good reason for the expenditure, and one which the department can explain and justify to the directors of the company, or to the public. I particularly enjoin a prompt and careful investigation of all accidents and a careful selection of witnesses thereto; for I contend that no department can be operated intelligently and carry out the principles herein advanced unless the department is so organized that the facts in each case can be promptly collected and relied upon by the claim agent and his attorneys, and no claim agent can properly know the value of any claim unless it has been properly investigated and the facts collected. All claims must be fairly and honestly dealt with, and whenever fraud appears upon the other side, either by the claimant or by his attorney, it must be struck down, and struck down so vigorously as to deter others from attempting a like scheme.

The position which should be taken in reference to claims which have no merit whatever—claims which are brought solely for the purpose of forcing a settlement at a nominal figure, my policy is to fight with the same vigor as cases where actual fraud is apparent.

By the adoption of the policy herein advocated it is barely possible that in the settlement of some meritorious claim too much may be paid, but in the long run, I have found that it is the better policy to pursue, and that the law of averages will show that by adopting the attitude herein recommended towards the public, the expense of the operation of the claim department will be materially reduced. It will also result in getting the good will of the people, and if your company has the reputation of being fair, persons who are injured, instead of rushing off to lawyers, will first see the company and endeavor to make amicable settlements, which are always preferable. And I have found that in this business it pays to have friends and the confidence of the public, rather than enemies and the public's distrust.

The blanks referred to by the author include the following:

A. Comparative detailed statement of expenditures, showing for the month of the current year, for the corresponding month of the preceding year, for the current year to date, and for the corresponding period of the preceding year. The expenditures are itemized under 32 heads as follows:

1. Collisions with persons—a, adults; b, children.
2. Collisions with vehicles and animals.
3. Collisions of cars.
4. Struck by trolley.
5. Employes injured.
6. Fell off cars.
7. Fell in cars.
8. Fell getting on cars.
9. Fell getting off cars.
10. Electric shock.
11. Cars leaving track.
12. Railroad-crossing gates damaged.
13. Miscellaneous.
14. Passengers ejected.
15.
16.
17.
18.
19.
20. Witness fees and expenses.
21. Expert testimony.
22. Doctor bills.
23. Hospital bills, ambulance bills, etc.
24. Special services.
25. Incidentals: Office expense, etc.
26. Salaries.
27. Wages of motormen, conductors, inspectors.
28.
29.
30. Court costs and expenses.
31. Court stenographer's and printing.
32. Attorneys' fees.

B. Comparative report of number of accidents from various causes on all lines. The comparisons are for the same periods as in Form A, and are itemized as follows:

Collisions with persons—adults, children.
Collisions with vehicles and animals.
Collisions of cars.
Struck by trolley.
Fell in cars.
Fell off cars.
Fell getting off cars.
Fell getting on cars.
Electric shock.
Cars leaving track.
Railroad gates damages.
Running-board accidents.
Miscellaneous.
Total.
Passengers ejected for trouble about fare or transfers; for disorderly conduct, etc.
Cars derailed at derailers.
Employees injured.
Cars damaged.
Personal injuries.
Fatalities.
Incidents.
Car-miles run per accident.
Car-miles run per passenger injured.
Passengers carried per accident.
Passengers carried per passenger injured.
Rides (transfers included) per accident.
Rides (transfers included) per passenger injured.

C. Monthly report of number and nature of accidents on each line. The accidents are classified as the preceding list from Form B, and are distributed in 20 columns, 16 for passengers of the various routes or lines operated, and four for employes; accidents to employes are distributed under the heads, shop and car house men; trackmen; line and power house men; motormen and conductors.

D. Report of number and nature of accidents for the current year to date, classification and distribution being the same as on Form C.

E. Monthly statement of amounts expended on account of accidents. This form is ruled to show comparisons for the corresponding month for nine years, the distribution being under 32 heads identical with those on Form A.

F. Comparative statement of Amounts Expended on Account of accidents for the current year to date. The ruling is the same as on Form E and the same 32 divisions are shown.

PRESIDENT BROCKWAY'S ADDRESS.

The prime object of a president's annual address in an association of this character is, it seems to me, to give the executive officer a formal way in which to set before the association the views he may have, based upon the experiences of the term of office, of the work and the future of the association. From that point of view I wish to take your time this morning to say some important things and to make some explanations.

Most properly, the first words I wish to say to you are such as shall express my appreciation of the honor you conferred upon me last year by electing me as your president. I was deprived, by my absence, from saying my thanks at the time of the election and I should take the honor lightly indeed if I did not, at the first opportunity, say that your confidence, coupled with the honor of the position, have touched me. It is a very honorable thing to be president of this association. It has much more than repaid me for any work I have done in the past and I thank you sincerely.

It is a peculiar and pleasant coincidence that this annual meeting of this association should be held in the state of Ohio

This, as you know, marks the end of the first decade of our work together, and those of us who were present at the first meeting in Cleveland must look around this room this morning with honest feelings of pleasure and pride. The greetings contain a sentiment it is good to feel. We have all these years been on business bent; striving for the better ways and clearer light to help us do more valuable work for others and so for ourselves. Yet there has grown up between us a friendship that is deeper than business and its methods warrant, a friendship as close and real, it seems to me, as it is possible to build under any circumstances.

It takes but a moment to remember the complete harmony of the years. Not an action, not a thing has occurred to mar, in any way, the steady purpose and work within the association. That of itself is remarkable enough from the human standpoint, but when one reads the list of accomplishments and realizes the tremendous force gathered by some of the things done, how the effect has spread and widened until new standards have been set up against which things and conditions are measured, it becomes more remarkable still. Add to that, the present standing of the association and there develops an associate history of which we must be proud and we all have a right to participate in the pride, because we have all helped.

It is a pleasurable duty I am performing by thus briefly putting before you a reminder of the results of ten years' work. At such a time as this, we should, it seems to me, look both backward and forward that the experiences gained may be used, so far as they may be, in the future.

The year just closed has been a very busy one, for the reason that it is the first under the new plan of consolidation of the associations. Everything has had to be rearranged and started off on a new track, even though the object desired to be obtained was the same as before. In this work I have had the cordial, helpful advice and assistance of the Executive Committee and especially have I called Mr. Young into conference many times. He is located so near to New York that he has had to bear the brunt and he did not fail me once.

The duties of president made me your representative upon the Executive Committee of the "American" association. I wish to report that I have attended one meeting in New York and one in Columbus and have assisted all through the year, as far as I was able, to get the new office well started.

From my experience during the year with the new plans of the American and the other associations, it is my opinion that the work of the associations, as now planned, will be sure to bring good results to the operation of electric railways in all branches. The new secretary, Prof. B. V. Swenson, of the American association, I consider particularly well equipped for the duties and only good can come from the present methods.

Over and over again, during the year, there have been evidences that the plan of amalgamation will not work to the disadvantage of our association. It is true we have not had all the money we desired this year, but we have managed to carry on all of the important duties, although to do this we have had to use practically all of the surplus left over from the past year. We have assurances, however, that when more prosperous times come to the American association the surplus will be made good to us. In this connection I wish to explain that at no time have we been refused all the money we needed. We have simply done all we could to co-operate with them and have done all we could to tide them through their first year. It should be clearly remembered that for the present co-operation is needed from all sources to the end that a great association may be built up which will, in every sense, be representative of the large interests for which we stand.

As the American association grows, so shall we; as they prosper, so shall we; as their membership widens, it means we are reaching more companies also. And even though we are, in every respect, a separate, distinct and self-guiding association, we have much to gain by their prosperity.

The problem of dues and the collection of them has slipped from among our problems, but the obligation to work for membership is still upon us. It is fixed that we grow with the growth of the whole, and growth means a wider opportunity to all the associations. Under present conditions a new member, attracted by one of the associations, is an addition to all of the associations and each member will soon learn to take advantage of all the opportunities of membership. All in all, I believe we shall gain by the new methods unless some element not experienced this year shall enter into the arrangement.

I would like to suggest that all accountants shall take advantage of the associate membership offered by the "American" association. It will put you in touch with the operating branch of the association work and will bring to your desk, for your own use, a copy of the annual report. This provides an opportunity to read and digest the work of other departments, as well as this.

To President Ely should go full appreciation of the honest and cordial way he has met us and our plans this year. He has been both able and considerate, and a very large measure of the present harmony is due to him.

It is natural that while blazing new trails this year a constant mindfulness of the future of the association should have brought out into clear vision some of the ideas of long ago, and, at the same time, given expression to new ones. I wish to take your time for a few minutes to point some of them out to you as I see them.

The date and some of the other details of the arrangements for this convention have been rather difficult to arrive at in a way wholly satisfactory to this association, which leads me to say that many, you will remember, I have always been of the opinion that our meeting annually at the same time and place with the other associations is not the most satisfactory plan for us to follow. I am fully cognizant of all the arguments on both sides of the question, and I am still of the opinion that, at some early day, this association must hold its annual meeting at its own time and place; that it may follow whatever plan it may desire or find proper without having to, at every point, square up to the other associations, so as not to affect them or let them affect the plans we find in our judgment to be the best for us.

Those of you who have attended most of the meetings of this association will remember that at only five out of eleven meetings have we been able to deliberate in the ways we know to be best for accounting subjects and one of the five satisfactory times was that one when we did meet alone at our organization meeting. In my opinion the argument of railroad fares should be eliminated. Our work is now important enough that the railroad fare does not enter into the consideration.

But I do not propose to here argue the matter, because it is familiar to you, but will leave it by again expressing my belief that the best interests of all concerned will be advanced by a separate time and place of meeting. I hope the time will not be long until the proper action is taken to make our meetings in the spring of the year or such other time as our own membership shall find convenient.

Other matters which will have their large bearing upon the future welfare of the association, the care with which you select your officers and the extent to which each member lets himself "go" in the association life. It is impossible for any organization to produce good results or even to do much more than keep alive if the members composing it are not active in it, even though they are sympathetic with its aims. And also is it not possible to succeed if the officers are not always keenly alive to the welfare of the association that honors them. This association has been wonderfully successful in this respect in the past and I believe will continue to obtain enthusiasm with each new list of officers, but experience seems to show that we should not select the members for our Executive Committee entirely from a geographical point of view, although the place of residence may be considered. A compact committee may be more easily brought together for real work than can one selected from all over America. A man's selection upon the committee and as an officer, should not be taken merely as a compliment—it means work, and only work can bring entire success to the association.

Even with a hard working Executive Committee, success cannot be gained unless you select for your president and your secretary men of positive convictions and character. Neither geographical location of residence nor association politics should be allowed to enter into those positions. In saying this, I do so entirely upon the platform that the association will be kept in continually capable working condition and not allowed to slow down nor become too self-satisfied.

It will be found comparatively easy for us to lose, in a short time, much of the gain we have made in ten years' work as an association; and the best way to safeguard that possibility is to be careful in selecting your officers. There is an old saying that "It is better to be sure than to be sorry." I think it may be used in this connection.

In regard to the presidency, it is my personal opinion that any gentleman whom you desire to so honor should be selected, not only for the work you expect him to do, but also as a compliment for the work he has already done for the association. In other words, it should go to one who has shown, by his interest and actions, that he has the welfare of the association at heart and is willing to put in one more hard and busy year to help the movement along.

I am further convinced that the presidential term should be limited by an unwritten law to one year. There will always be some one eligible for the position and I do not think it will be fair to anyone to ask him to give up so much of his time for two years.

Understand me rightly when I make these suggestions. They are only my personal opinions, but you have, in the past ten years, kept me in the position of either secretary or president, and I am now giving you some of the opinions which are mine after those ten years.

And I want to impress upon all who hear me and all who shall read these words, that this is a mutual association. It is put together for the mutual give and take from each other, the large and the small helping and encouraging each other. The fact that the association is a mutual one is where every member comes in. It is up to you, each one of you, to decide if you want to give or take or both. The future of the association and of your profession, in a large measure, rests upon how much each individual helps this movement with his own little or big push. I believe, positively, that as you work for the interests of this association, so will you benefit in knowledge and other ways. And as you work, so shall the association grow, and as it grows, so shall it, with good management, do a work which must leave its imprint upon our profession and our business and upon each of us.

It rests wholly with you, gentlemen, what shall become of the next ten years' work. The first ten have passed rather quickly and the next ten will do the same. A correct reading of the future would be interesting, but what is the gain by it? The element of chance and personal hard work would be lost. They both go far to explain success. At any rate, we should keep constantly before us that we can make this association greater and more useful than it is now. There is plenty to do and to work for in the way of principle. It rests wholly with you.

Now and then, since the completion and adoption of the present Standard Classification of Accounts and the Standard Form of Report, the thought has been expressed that the important work of the association was about over and the organization would soon become a formality and live a monotonous existence. To those who have closely followed the life and work of the association, this has been an aggravation. We have felt that there is a long and useful term of years ahead and that careful and thoughtful management, together with the growing confidence placed by the financial and operating interests in the results of the deliberations of the association, the very high standard attained would be continued.

However, as a partial answer to the doubt referred to, your Executive Committee has arranged a programme this year along unique lines. There is no set paper upon any subject heretofore discussed and the titles selected are to be handled by gentlemen who have not previously appeared before us in that light. This, understand, is no reflection whatever upon our previous programmes, because the same condition has existed before, but we were actuated by a desire to handle new subjects from new standpoints and also re-enthuse everyone into confidence in the future.

It must be remembered, though, that new subjects are not always desirable when old subjects remain undecided and we have one such unsettled matter before us. I refer to the attempt to standardize shop reports. For various reasons that has lain dormant for two years and should have been attempted again this year, but owing to the enforced change in the personnel of the committee and also because of the husbanding of our financial resources, it was decided, after consultation with Mr. Adams, president of the Engineering association, to defer the matter for another year. I shall ask you, therefore, to take action at this meeting to express your wishes to the incoming administration, that it may be guided therein.

Two of the papers to be read to and discussed by you have a direct and far-reaching effect upon the capital expenditures and provisions of our companies. Neither of the subjects can be completely digested at one convention. Especially does this apply to the whole subject of "Depreciation."

The importance and the confusion of honestly opposed opinions of the reasons for and the scope of depreciation is such that it has long been recognized some steps should be taken to clear the atmosphere so it might be understood aright. No depreciation in all its phases and various percentages is right, then it is just and fair that it should be honestly recognized and provision made accordingly. If, on the other side, it is not right, then that should be understood and the issue closed. If, again, it is partly right and partly wrong, the times and extent, when it is right, should be learned and the times and extent when it is not right should be set out that all may be informed. There is no question but that the doubt about it has magnified both sides of the attitude toward it, so this movement of discussion will do much to straighten out hazy and half knowledge of the problem.

It should be clearly understood that the element of conditions enters somewhat into the treatment, in practice, of depreciation. This being so, it is high time that those conditions which affect it should be set forth and understood.

Your Executive Committee has very wisely, I think, set limits into which this year's discussion shall be kept. Yet it will be appreciated that the limits contain space enough so that the discussion may move freely and be productive of good. There has been no desire to, in any way, slight the whole of this problem by the restrictions placed about this year's discussion of it. But your committee thought the whole subject is so large and so easily can the discussion be turned into what is known as a "water haul" by attempting the whole subject at once, that by directing our attention to one phase only, we would make definite progress with this opening wedge.

It has been clearly recognized that this discussion will last several years and we do not wish to have any part of it spent in lost time. Without a doubt, at the end of the day's discussion we shall be in a better position to talk of future plans than we are today; at any rate, a start is made and I am sure we should soon be in a position to know what it is all about and why anyone ever thought of it in the first place. The same success should follow this as has followed our other large undertakings.

Both subjects relating to capital expenditures on our programme have great importance when we look ahead into the future, and there is no doubt we have arrived at a point where we must give more serious attention to the future. There are many specious and trite sayings that the future will take care of itself and that the stockholders who take the present risk should also get the present gain and many other crisp and jingling sentences of a like tenor. We have all heard them and some of us rather half believe half of them, but, above all, it is for the accountant to keep his head clear and his blood cool, that he may place his advice and his practices into the right course; to play searchlight into the future for those who are the engines and the pilots of the business we represent.

Therefore, our programme this year is particularly timely. It is no small matter to select and account for the expenditure of capital, and it is a much, a very much, more difficult subject to reduce those charges after the expenditure is made. Believe me when I say that in a large measure the future of the industry depends upon these two subjects and many of you will agree with me that that future is not so very far away, either. It cannot possibly be long, as great events measure time, before those corporations which have allowed themselves to arrive at the end of the highway called "Capitalization," will and must face a tremendous problem. With terminating franchises, a road wearing out and a capitalization per track mile of many hundreds of thousands of dollars that chapter will be written.

What about the stockholders when that time comes? What will be done when the motive power changes again? What will be the security supporting long-term bonds under such conditions?

It is a time we must face and we must do much thinking in advance. There is a struggle coming and you and I shall participate in it, when a mastery of the subject which shall bring that time about shall stand us on the right side. I do not pretend to prophesy what the subject will be, but if you follow the trend of current events seriously, it will some day show itself. The two papers and discussion on the accounting for expenditure of capital and the reduction of it after expenditure will be part of it, I believe.

The other subject we are to discuss is distinctly operating. The use of curves in expressing statistics is both old and new; yet they have never been brought out to their full usefulness. Everything which promises to be useful should be tested and if found correct, used to demonstrate to the operating official what he has accomplished. He is more than willing—he is anxious to find and make use of anything that will put him closer to his problems. Statistical curves are distinctly within the work of the accountant, as is any work of a statistical nature.

We have never discussed this exact subject before and there are few experts in the work. We have been fortunate this year to get the experience of the gentleman who most uses them, and your committee hopes to start the work into more general practice, believing that it is another distinct help to the operation.

This association put the car-hour, the one most essential unit, into practice, and if the use of curves, assuming them to be as useful as they promise, will help to point our other phases of operation, it will be another good accomplished.

This explanation of what is hoped and expected of the programme of this convention is made that it may be understood the programme was arranged with a definite plan in view and not simply strung together in order to have something to talk about. If the expectations of your committee are realized, the association and those present will have gained something worth while.

The association has had to witness the retirement of one of its past presidents from the electric railway business this year to take up work in another field. I cannot let this opportunity pass without, so far as I am able, expressing, in this public manner, a very sincere personal regret that this change has occurred. I refer to Mr. H. C. Mackay and I am sure everything I can say and feel at his withdrawal will be repeated by each one of you. The record of Mr. Mackay is so well known that I need not recapitulate it here, but this association has gained some of its accomplishments from him and he deserves all and more than we can give him in the way of thanks and respect. I recommend a resolution that he be elected an honorary member of this association, with full privileges of the association for all time.

Because of the resignation of Mr. Duffy from the committee on Standard Classification, the committee on Standard Form of Report and the committee on International Form of Report, I have appointed William F. Ham, chairman of the committee on Standard Classification, and Elmer M. White to be a member of that committee. Henry J. Davies succeeds Mr. Duffy as member and chairman of the committee on International Form of Report. The vacancy in the committee on Standard Form of Report has not been filled. Frank R. Henry has succeeded Mr. Mackay in the committee on Standard Classification and Fred E. Smith has been appointed a member of the committee on International Form of Report to succeed me. These many changes are important and mean much in the coming work.

And now I come to what, in my mind, is a very important subject. I want to say a few words to you about the accountant and his duties.

The old time when we were book-keepers and no more has passed, I believe, permanently. So much more is demanded of us and confidently expected that we measure up to the requirements that I cannot refrain from mentioning the matter, even at the risk of being long in this address.

We are certainly, at this present time, in a much different place than we occupied ten years ago. There is no doubt that greater demands are made upon us as a class than there were at that time. We are not mere tabulators of figures any more. We have become, in a large measure, business advisors, and one of the five senses making up the whole of the business body. Therefore, it is well to give consideration to our needs in filling our duties up to which we must measure. The necessity of a broad mind is so apparent that it must be recognized. The nature of the work we perform tends to train us into hair-splitting and petty detail, and if we permit full swing to that tendency, we must each find ourself in such a narrow way that the larger and more helpful work must be performed by someone else, although it is quite within our present duties and our capabilities.

There are much greater things than making figures balance. Don't forget that. We must learn to analyze, to pull apart and compare, not alone the accounting system, but the financial plans of our own and other companies.

Banking methods and the trend of money; the corporation and taxation laws of many states; the procedure followed in reorganization and many other things which will readily occur to you are now required. It makes it necessary that we must read and study much and patiently, that we may come up in the fullest sense to our opportunities.

Confidence in figures is frequently helped by confidence in the accountant; therefore, what we really are is of inestimable value in the place we fill. No one will contradict me when I say that just now one of the most needed elements in business is confidence. You are the only one who can fix that for yourself.

We must also keep up with the times. The easiest thing we can undertake is to get in a rut and it is the most dangerous to our future. Keep up with your office and the office up to the times, but by that I don't mean to adopt every idea presented to you, but be informed about it and think some out yourselves.

Get away from a small conception of the duties of the office and fill larger ones. As we do so, shall the larger ideas be considered as a part of the requirements of a modern accountant.

Thus, briefly, do I throw out an idea I hope we may all consider, and as a recapitulation, I make use of Shakespeare's lines in Hamlet:

"And these few precepts in thy memory
Look thou character. Give thy thought no tongue.
Nor any unproportion'd thought his act.
Be thou familiar, but by no means vulgar.
The friends thou hast and their adoption tried,
Grapple them to thy soul with hooks of steel;
But do not dull thy palm with entertainment
Of each new-hatch'd, unfledg'd comrade. Beware
Of entrance to a quarrel; but, being in,
Bear't, that th' opposed may beware of thee.
Give every man thine ear, but few thy voice;
Take each man's censure, but reserve thy judgment.
Costly thy habit as thy purse can buy,
But not express'd in fancy; rich, not gaudy;
For apparel oft proclaims the man;
Neither a borrower nor a lender be,
For loan oft loses both itself and friend,
And borrowing dulls the edge of husbandry.
This above all—to thine ownself be true;
And it must follow, as the night the day,
Thou canst not then be false to any man."

THE LUMEN EXHIBIT.

The Lumen Bearing Company, of Buffalo N. Y., manufacturer of Luman bronze bearings and Ideal trolley wheels, has an attractive exhibit in Building 2, Section D. A large model of the Ideal wheel is shown with a background of American and Canadian flags, representing the Buffalo and Toronto factories. Some recent changes in this trolley wheel have improved it to such an extent that it is making higher mileage records than ever before, especially on high-speed interurban service where the perfect balance which is insured by its construction is a particularly valuable feature.

It will be well worth while for all delegates who are interested in the trolley wheel question to investigate the new Ideal trolley wheel. The company is represented by Mr. E. P. Sharp and Mr. C. W. Stimpson.

GAS ENGINES.*

BY PAUL WINSOR, CHIEF ENGINEER MOTIVE POWER AND ROLLING STOCK, BOSTON ELEVATED RAILWAY COMPANY.

This paper will deal with the experience that the Boston Elevated Railway Company has had with its two gas engine plants.

These plants have now been in operation, one about four months, and the other (partially) for a few weeks.

A little over a year ago the subject came up of supplying power to two sections of the railway that were rather hard to reach from the present power stations, and as we had for some time been looking into the question of gas engines, it was decided that this was a good opportunity to make a trial of them. Both plants are small, one of 700 kilowatt, and the other of 975 kilowatt capacity. The engine load factor in both stations can be made extremely good, as they feed into the trolley lines in multiple with the steam stations of the road.

As you are not interested in the buildings I will only say that they are of brick and concrete throughout, with reinforced concrete floors and flat roofs, and that there is a great deal of light and ventilation.

The equipments of these two plants are radically different. The Sommerville plant has down draught suction producers and 4-cycle, single-acting engines, and the Medford plant has up-draught pressure producers and 2-cycle, double-acting engines.

Unfortunately for this paper, we have run the Medford station so little—through no fault of the equipment contractors—that no figures are available, and I must, therefore, confine most of my remarks to the Sommerville station.

The Medford station has:

R. D. Wood gas producers, with blowers, tar extractors, scrubbers, etc.

Koerting 2-cycle, double-acting gas engines.

Crocker-Wheeler generators.

The gas plant is similar to, although larger than, the United States Government testing plant at St. Louis, which has been in continuous operation now for two years or more, making gas successfully from all kinds of coal.

The engine plant is similar to, although smaller than, the Lackawanna Steel Company's plant at Buffalo, where there are a larger number of these engines running successfully on blasting-furnace gas. As before stated, this plant has been run very little. This has not been the fault of the plant, but has been owing to our wishing to thoroughly work out the exhaust question before putting the plant into regular operation. The station is in a residential district, and the noise of the exhaust of the one engine started was such as to seriously annoy the neighbors. We have, therefore, been experimenting for nearly two months, during which time only one engine has been run, and that very little, so that no economy tests have been possible.

The Sommerville station has:

A Loomis-Pettibone gas plant, with the necessary exhauster, scrubbers, holders, etc.

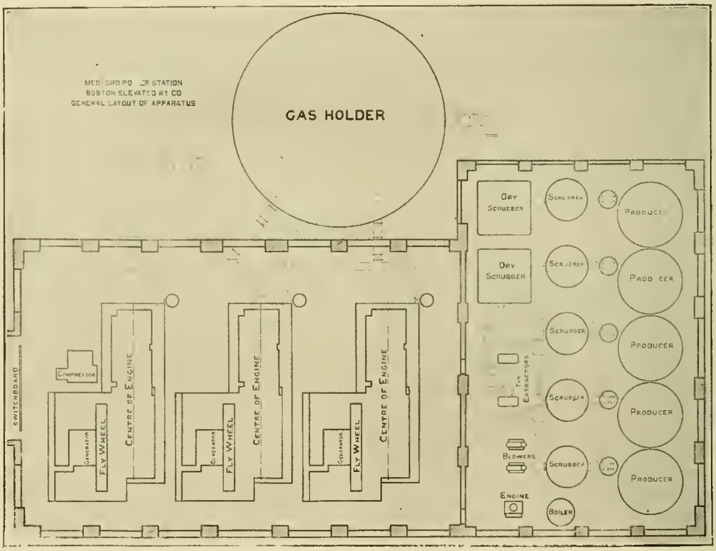
American-Crossley engines.

Crocker-Wheeler generators.

The Sommerville station has been in commercial operation since May 4, 1906, and up to August 31 it has used 1.45 pounds coal per kilowatt-hour.

During May—from May 4 to May 29, inclusive—but one engine was in use. Since then two engines have been running. The station is run week days from 7:00 a. m. to 11:00 p. m. and on Sundays in the afternoon only. The engine load factor has been about seventy-four percent.

June 10 a thirty days' test run was begun. During these thirty days the station was run 16 hours per day, from 7:00 a. m. to 11:00 p. m. with an engine load factor of a little over 70 per cent. The average Pocahontas coal per kilowatt-hour delivered from the station was 1.31 pounds. This included all the fuel used, whether for running the engines, building fires after cleaning, or in the auxiliary boiler.



Plan of Medford Power Station.

From May 4 to September 3, inclusive—the four months in which the station has been in regular commercial operation—the fuel per kilowatt-hour output has been 1.45 pounds. These figures are as good as the most enthusiastic have ever hoped for. The plant has proved its reliability, and the shut-downs have been very few. There have been no shut-downs of any kind in the gas house. This portion of the plant has run regularly and without any trouble and has made a uniform grade of good gas.

In the engine-room there have been interruptions, but these have almost all been of the kind to which any new power plant is subject. The longest delays, in fact the only real shut-downs, were due to improper water connection with the piston. This matter, however, has been remedied. We have had one case of hot crank-pin, probably due to too quick starting. These engines can be set running so quickly—well inside of sixty seconds, and often close to thirty seconds—that the temptation has been to see how quickly it could be done, resulting, as before stated, in one case of hot crank-pin, the oil not having been given time to reach it after six hours' shut-down.

As a result of my experience with these plants, I am absolutely convinced of the economy and reliability of a gas engine power station. The fuel consumption will be about one-half as compared with a steam plant, running from less than 1.5 pounds to 1.75 pounds, according to the load factor and almost regardless of the size of the plant, as against three to four pounds in similar steam plants.

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*Presented before the American Street & Interurban Railway Engineering Association, Columbus, O., October 16, 1906.

The cost of the gas plant, including producers, is undoubtedly considerably higher than the cost of a similar sized steam plant, and whether the fuel saved will justify the increased capital depends on the price of coal, but it seems that with coal at $3 and upwards, there will be a material net saving by the use of gas.

Another advantage of a gas plant is the high efficiency of a small plant, the efficiency being practically the same for engines as small as a couple of hundred horse-power as for those of larger size, which of course is not true of a steam plant.

The question is of course asked: "What are the disadvantages of a gas power-station as compared with a steam plant?" I am glad to say that they are few. The gas-producing portion of such a station is simpler, easier to operate, and holds its efficiency better than a steam plant. The losses from banking fires are extremely small, and the plant can be got into service much quicker than can a steam plant. It is our practice to shut down at 11:00 at night and start at 7:00 in the morning. Fifteen or twenty minutes are required to get the gas plant into full operation, while of course with a boiler plant it takes from one to one and a half hours to get the fires into first-class shape. The ashes have to be periodically removed from the producer. In our plant this has to be done while the producers are out of service and takes about three hours twice a week, although the plant can be run two days longer without cleaning, if necessary. With some forms of producers the cleaning can be done while the plant is in operation, but I have had no experience on this point as yet, as our second plant, which has this form of producer, has not been in continuous operation. The wet and dry scrubbers have to be cleaned every few weeks, but this work is certainly no more difficult than the work required around a boiler, cleaning soot from the tubes and from the soot-chambers.

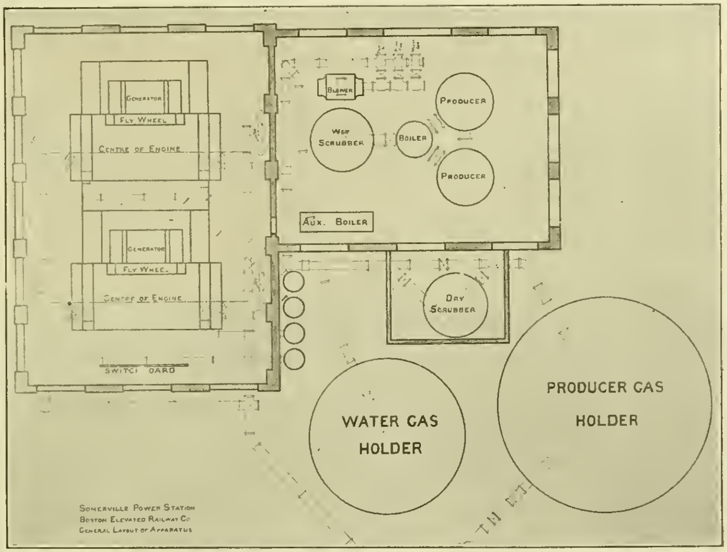
An ordinary gas man, such a man as would be considered a first-class fireman, can run at least as many horse-power of gas-producers as he can of boilers. He can make a very uniform grade of gas and will get regularly very much nearer the possible efficiency from the gas-producers than from the boilers. We have, however, found the Ardos carbon dioxide recorder of great assistance. Without it we found that the gas man would vary his carbon dioxide from 5 to 7 per cent., while with it he would hold it below 5 per cent. It is, of course, much more satisfactory for a man to know actually what he is doing from minute to minute than to work entirely on his judgment.

The ordinary steam engineer is, of course, afraid of a gas engine, just as a stationary engineer is afraid of a locomotive, but a few months' practice should make of a good steam engine runner an equally good gas engine runner.

The handling of the water jackets is, of course, extremely simple. The problem comes in the ignition, but with a well-designed gas engine, equipped with a duplicate system of igniters, there would be little, if any, trouble.

A gas engine will hold its efficiency much better than a steam engine. With a steam engine, poorly-set or leaky valves will interfere seriously with its efficiency. With a gas engine the effect of improper ignition or valve setting, or even leaky valves, is generally either to cause a knock, therefore at once announcing itself, or to reduce the output of the engine. None of these things materially affect the efficiency without showing also in other ways.

The water required is considerably less for a gas plant than for a condensing steam plant and considerably more than for a non-condensing steam plant. A non-condensing steam plant will use for all purposes from 40 to 50 pounds of water per kilowatt-hour. A condensing steam plant will use from 20 to 30 pounds for steam, and from 600 to 900 pounds in the condenser per kilowatt-hour. A gas plant will use about 200 pounds per kilowatt-hour.



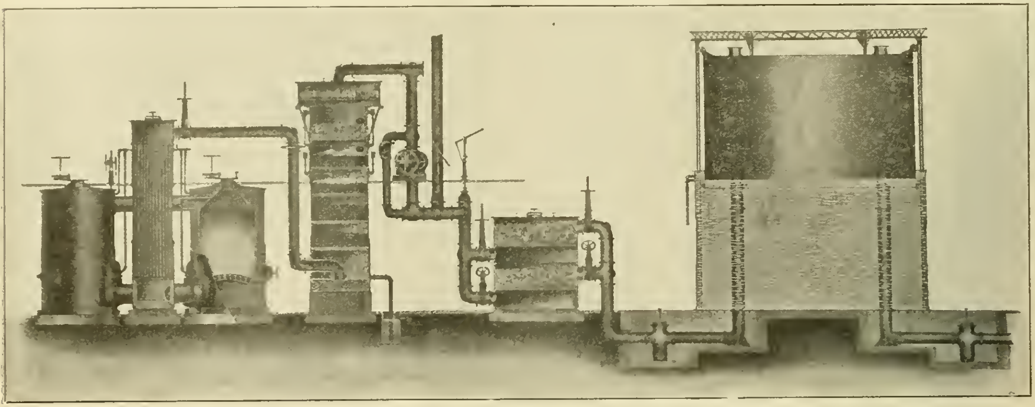
Plan of Somerville Power Station.

The only two serious troubles that we have had have been premature explosion and back-firing in the engines and noisy exhaust. The exhausts we now have pretty well under control and certainly they can be made entirely unobjectionable, if not noiseless.

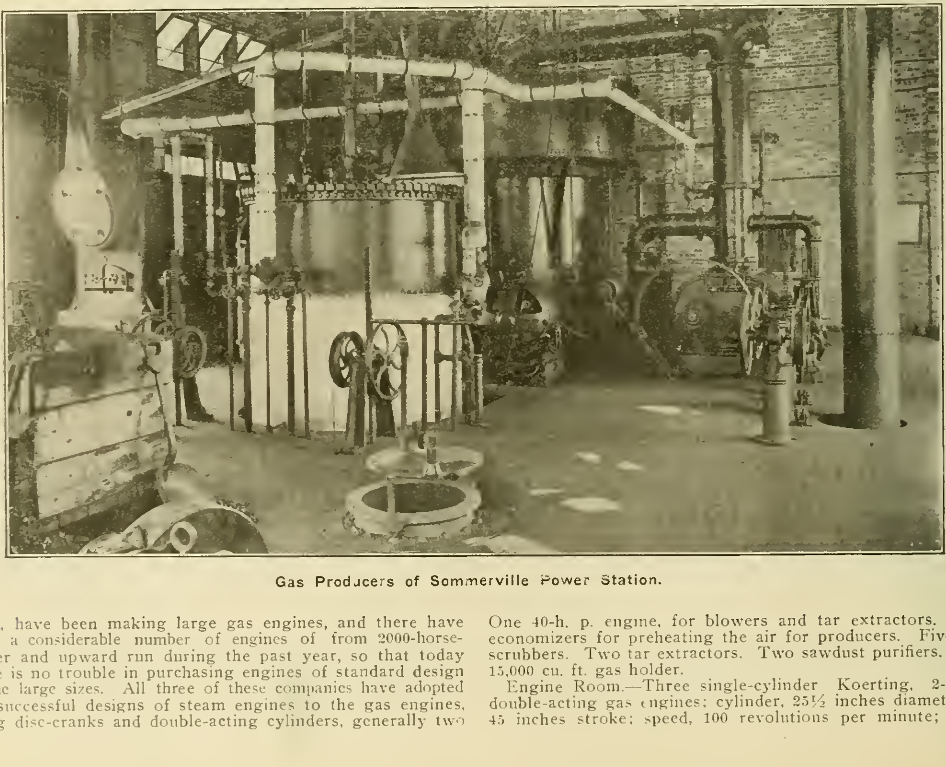
Premature ignition and back-firing have both given us a good deal of trouble, and on both types of engines have at times been bad, so bad as to materially reduce the engine power for the moment. This trouble is now much less than it was, and even if not further eliminated will not interfere with the regular and commercial operation of the plants.

There are many forms of producers that can be used successfully with hard coal, using sizes at least as small as pea and as small as No. 1 buckwheat if it is of good quality. Soft coal cannot be used in most of the producers without the addition of tar extractors. Much soft coal has been used at the Government testing station at St. Louis, the tar extractors doing their work very successfully.

Soft coal can be used in down-draught producers, such as we have in our Somerville plant, without any tar getting into the gas, the tar being "cracked" on passing through the hot fires, breaking up into gas and some lamp-black, this lamp-black soiling the scrubber water to such an extent as to make it objectionable if turned into a clear stream. This lamp-black can, however, easily be separated from the water by allowing the water to become quiescent in a comparatively small tank, the lamp-black rising to the surface.



Complete Train of Gas Producer Apparatus.



Gas Producers of Sommerville Power Station.

For many years and up to very recently, gas engines have been made by comparatively small companies and in small sizes, most of them following closely the early gas engines in being single-acting and having trunk pistons. This form is not adapted to large sizes, it being expensive, if not impossible, to build, and requiring a great deal of oil. Most of the engines have been and are being built on the 4-cycle principle, there being, so far as I know, but one large manufacturer of 2-cycle engines.

In the last few years the large steam engine manufacturers, such as the Allis-Chalmers Company, the Snow Steam Pump Company and the Westinghouse Machine Company, have been making large gas engines, and there have been a considerable number of engines of from 2000-horsepower and upward run during the past year, so that today there is no trouble in purchasing engines of standard design in the large sizes. All three of these companies have adopted the successful designs of steam engines to the gas engines, using disc-cranks and double-acting cylinders, generally two cylinders in tandem, giving two impulses to each revolution of the crank, as with the single-cylinder steam engine. In the larger sizes they use the two-crank arrangement with the generator or fly-wheel between, each crank having two double-acting cylinders. The valves are always poppet valves, both intake and exhaust driven from a lay shaft parallel with the cylinder.

As this problem has been taken up independently by these three large and successful steam engine builders, and all have arrived at practically the same solution, it is safe to say that the gas engine of the immediate future will be of this type.

At the Medford power station the equipment consists of the following:

Gas House.—Five up-draught water-sealed gas producers, 9 feet in diameter. One auxiliary steam boiler, coal fired. One 40-h. p. engine, for blowers and tar extractors. Five economizers for preheating the air for producers. Five wet scrubbers. Two tar extractors. Two sawdust purifiers. One 15,000 cu. ft. gas holder.

Engine Room.—Three single-cylinder Koerting, 2-cycle, double-acting gas engines; cylinder, 25½ inches diameter by 45 inches stroke; speed, 100 revolutions per minute; rated capacity, 500 brake-h. p.: duplicate "make-and-break" electrical igniters; igniter current from vibrating magnetos mounted on engine. Three Crocker-Wheeler direct connected railway generators, rated capacity, 325 kilowatts; normal voltage, 500 volts, normal amperes, 591. The switchboard is arranged for 3 generator and 6 feeder panels and 1 station panel, circuit breakers, recording watt-meters and volt-meter etc.

There is an overhead crane, hand operated and supplied with 8-ton and 1-ton hand hoists.

The water is supplied from three 8-inch Artesian wells of an average depth of about 550 feet.

The normal rating of the station is 975 kilowatts and the maximum capacity, 1,300 kilowatts.

At the Sommerville power station the equipment consists of the following:

Gas House.—Two Loomis-Pettibone soft coal down-draught producers, 9 feet in diameter; one regenerator boiler; one coal-fired auxiliary boiler; one vertical wet scrubber; one Root exhauster, steam driven, with electric motor as auxiliary; one dry scrubber; one 15,000 cu. ft. gas holder for producer gas; one 5,000 cu. ft. gas holder for water gas.

Engine-Room.—Two two-cylinder American-Crossley, 4-cycle, gas engines; cylinders, 32 inches in diameter by 36 inches stroke; duplicate "make-and-break" electric igniters on each cylinder; igniter current supplied by two motor generators and a storage battery; speed, 140 revolutions per minute; rated capacity, 600 brake horse power each. Two Crocker-Wheeler direct-connected railway generators: rated at 350 kilowatts each; normal voltage, 550; normal amperes, 636. The switchboard is arranged for 2 generators, 5 feeder panels and 1 station panel, with circuit breakers, recording watt-meters and voltmeters, etc.

There is an overhead crane, hand operated, with 8-ton and 1-ton hand hoists.

The water supply is from Alewife Brook, by two-stage, centrifugal, motor-driven pumps. Filtered by a pressure sand-filter.

The normal rating of the station is 700 kilowatts, and the maximum capacity is 933 kilowatts or one-third overload.

Fourth Day Economy Test—July 12, 1906. Sommerville Sta.

Pounds of coal, total		13,000
Pounds of coal per kilowatt-hour		1.37
Load factor, Electrical		84.5%
Cubic feet mixed gas		1,397,000
Cubic feet water gas		50,500
Cubic feet producer gas		1,346,500
Per cent water gas		3.61%
Cubic feet mixed gas per hour		87,400
Cubic feet mixed gas per kilowatt-hour		147.3
Pounds coal		107.5
Mixed gas B. T. U. High		126.5
Mixed gas B. T. U. Low		122.5
Water gas B. T. U. High		288.7
Water gas B. T. U. Low		269.5
Producer gas B. T. U. High		120.8
Producer gas B. T. U. Low		117.0
Cubic feet water—7 a. m.—11 p. m.		32,045
Cubic feet water cooling valves	1,038	
Cubic feet, economizer	277	
Cubic feet, scrubber	7,445	
Cubic feet, engines and waste	23,285	32,045

Third Day Economy Test—July 11, 1906.

	Coal Analysis. As received.	Dry Coal.	Combustible.
Moisture	2.30	.....	......
Volatile matter	18.48	18.90	20.25
Fixed carbon	72.79	74.52	79.75
Ash	6.43	6.58	......
B. T. U. per pound	14.030	14,360	15.380

Third and Fourth Day Economy Test.—July 11 and 12, 1906.

Mixed Gas Analyses.

Date	6/11/06	6/11/06	6/12/06
Time	5:05 p. m.	8:25 p. m.	5:12 p. m
CO_2	3.5	3.0	3.6
O	.2	.2	.2
CO	26.9	27.4	27.2
CH_4	1.2	1.0	1.1
H	9.9	9.1	8.5
N	58.3	59.3	59.4
B. T. U. at 60° F.	132.1	133.8	127.5

Exhaust Gas Analysis.—July 31, 1906.

Sample taken from elbow at muffler of engine.

No. 1.—A end.

CO_2	11.7% volume.
O	13.0% volume
CO	trace
N	75.3% volume.
	100.0%

This sample shows that an excess of air of 65% was being used at time sample was taken.

REPORT OF THE COMMITTEE ON STANDARDIZATION.

H. WALLERSTEDT, CHAIRMAN; H. A. BENEDICT, W. H. EVANS, H. B FLEMING, J. M. LARNED, F. H. LINCOLN, PAUL WINSOR.

The utter lack of standardizing of materials was forcibly brought to light in the tabulation of the answers to questions submitted by the committee on Maintenance and Inspection of Electrical Equipment in the course of its investigations during the year 1905. The immediate result was the appointment of a committee on Standardization at the Philadelphia Convention.

Because of the great amount of ground it will be necessary to cover ultimately, the committee decided, at the beginning of its work that the immediate investigation should be limited to those questions which have appeared to the committee as being of the greatest importance and most in need of early adjustment. It was further considered wise to confine the investigations to such parts and dimensions of the particular equipment under consideration as would make it interchangeable, leaving to the individual worker and seeker after improvement as wide a field of operation as circumstances will permit.

The committee has also deemed it advisable to avoid designs involving patents, and, for the present at least, no attention will be given to the chemical analysis of the material contained in the parts standardized.

After a careful consideration of the subject, it was decided to confine the work of the year to the standardization of brake shoes, flange and tread of wheels, rails, and journals and journal boxes. It will be observed that these parts are more or less dependent upon (and bear a certain relation to) each other. As preliminary steps toward standardization, it has been considered necessary to prepare data sheets for the purpose of collecting such data and drawings as would enable the committee to base its future recommendations upon the experience and practice of the various street and interurban railways. (Copies of these data sheets, together with copies of the circular letters which accompanied them, are given in the appendix which forms a part of the report.)

Considerable thought and time have been given to the preparation of these data sheets, and it has been the endeavor of the committee to ask for only such information as would bear directly upon the subject under consideration.

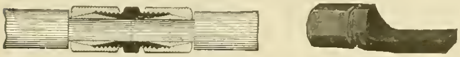
It is gratifying to be able to report that many manufacturers have shown a great deal of interest in the work set before the committe, and that they have given very material aid by the sending of the representatives to our conferences in New York City. The correspondence pertaining to this work, which has been very large, and the printing and distribution of the data sheets and circular letters have been carried out through the New York office of the American Street and Interurban Railway Association, and we feel greatly indebted to its secretary for the interest he has shown in these matters. The data sheets and circular letters have been sent in duplicate to over 800 street and interurban railway companies to be filled out and returned with accompanying drawings and sketches. A considerable number of the data sheets on brake shoes and on flange and tread of wheels have been filled out and returned with sketches and suggestions as to proposed standards. The replies indicate that the managers and engineers of the railway companies realize the importance of the work, and that they have given considerable time and thought to the preparation of their answers to the various questions asked. A number of the data sheets relating to rails and to journals and journal boxes, together with accompanying drawings and sketches, have also been received at the secretary's office; although it was not practicable for the committee to issue these data sheets before the middle of September.

The information obtained by means of these various data sheets must be carefully collated and summarized in order to make it practicable for the committee to make proper use of the same. The drawing and sketches must also be studied, and new ones made up which embody the recommendations of the various companies. This means a large amount of detail work on the subjects now under investigation, which must necessarily devolve upon your standardization committee during the coming years. It therefore does not appear to the committee to be advisable for the association to undertake much new work in the line of standardization of equipment at the present time. However, it would be well to begin the investigation of the standardization of some few additional parts of electric railway equipment in order that the work of the committee may be continuous and uninterrupted. Mr. J. S. Doyle has wisely suggested that the next matter to be considered should be that of the standardization of motor parts and your committee would respectfully recommend that the association decide to add the standardization of motor parts to the work of the standardization committee for the coming year.

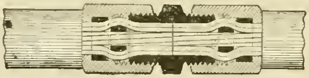
It is our desire to emphasize the necessity of standardization of equipment. Some street and interurban railways have already made sincere efforts to standardize certain parts of their equipment, parts that would be standard so far as these particular companies are concerned, but no joint effort has heretofore been made in this direction. Owing to extensions and consolidations which are constantly taking place in the various electric railway systems, an interchange of cars and equipment will ultimately become necessary, and it is the hope of the committee that the companies which have not already returned the data sheets will give them prompt and careful consideration.

DOSSERT SOLDERLESS ELECTRICAL CONNECTORS.

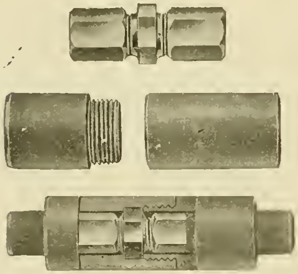
The most disagreeable features of cable work, particularly in case of the larger sizes, are splices, taps and terminal connections. The Dossert joint has been designed to overcome these difficulties, and at the same time to make connections which shall be good electrically and mechanically, without the use of solder, at a cost which is less than that of the ones formerly made. The joint is made of seven parts, six of which are in pairs. The duplicate parts are compression nuts, outside rings, and inside rings. The nipple, as shown in the type B joints is for a two-way joint, but it may be made three-way or four-way, if so required.



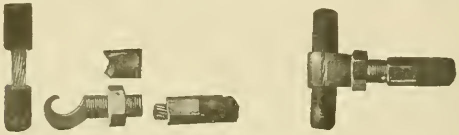
Type A, Cable Joint and Lug.



Type B, Cable Joint.



Two-Way Motor Lead Joint.



Cable Tap Parts.

The way in which a Dossert joint is made is very simple and is as follows: The ends of the cable to be joined are thoroughly cleaned of insulation for a length of from ⅛ inch more than the length of the compression nut for the smaller sizes, to ⅝ inch more for the larger sizes, so that the two ends of the cable will be butted together in the center of the connector when the joint is made up. The compression nut and outside ring are next slipped over the end of the cable, and driven securely home by means of a forming tool provided for the purpose. After this has been done, the outer strands of the cable are opened, the small ring is placed over the core and driven down as far as possible by means of a smaller forming tool.

The outer layer stands are then molded into their original position, using the larger forming tool for the purpose.

The other cable end being similarly prepared, the joint is ready to be put together; and to complete the connection, it only remains to screw the nuts securely on the nipple.

It will be noted that the inside ring makes a bunch in the cable inside of the nut, and that when pressure is applied by screwing up the nuts on the nipple, contact is obtained between the connector and the cable, in addition to that which is got by butting. The contact pressure obtainable is only limited by the strength of the nut to withstand splitting and that of the threaded portion to resist stripping, and it is evident that the contact thus secured is good.

After the joint has been completed, a hexagonal sleeve may be slipped over it; this locks it securely, eliminating any chance of its parts becoming unscrewed. The use of the sleeve, however, is only necessary in places where there is considerable vibration.

The type B joint which is for stranded cables only is made of composition or drawn brass. The type C is similar to type B except that the nipple is made of copper. Both of these types are for work where the joint is subjected to tensile stress. For splices not subject to tension the type A joint, which has no inside rings is used. Type D joints are made in aluminum.

The conductivity of the type B joint is placed at from 70 to 90 per cent of that of an equal length of cable, depending on how well the joint is put together. The carrying capacity of the joint, however, is greater than that of the cable because of the larger section.

The Dossert cable tap, shown in parts and assembled, affords a neat connection, without cutting the cable or making a soldered joint. One of the illustrations shows the Dossert insulated 2-way motor lead joint. All kinds of taps, lugs, Y's, 3-way and 4-way joints, etc., are also made.

The advantages claimed for the Dossert joints, which are manufactured by Dossert & Co., Incorporated, 242-244 West 41st street, New York City, are that they are neat, workmanlike, cheap, and easy to put together, while the soldered joint is clumsy, expensive, and hard to make. In making a Dossert joint there is no waste of cable, and no special tools are required other than the two small tubes, for driving the rings, and a hammer. In making a soldered joint, there is a great waste of cable, and it is necessary to have a torch, solder-pot, solder, gasoline and other accessories peculiar to this method of making a connection. The time required to put together the Dossert connector is insignificant compared with that for making a soldered joint. For example, it takes one man about seven minutes to make a joint in a 1,000,000 c. m. cable, using a Dossert connector, while to make a similar soldered splice, a man and a helper would spend in the neighborhood of two hours, even under the most favorable conditions. To make a soldered joint, it is necessary to have the services of an experienced man; while to make a similar joint with a Dossert connector, those of an unskilled mechanic will do just as well.

The Green Fuel Economizer Company, of Matteawan, N. Y., has no exhibit at the convention, but the Green economizers may be seen in the principal power plant of the Columbus Railway & Light Company.

* * *

Members of the auditing and legal departments of street railways should be especially interested in the exhibit of the Security Register & Manufacturing Company, and should note the ease with which daily results are obtained by the use of its recording register, and the evidence which this method furnishes in case of accident. The use of such recording registers would seem to make it impossible for anyone to ring up a fare without the consent of the conductor. At the same time these instruments allow all employes connected with the operation of the cars to place their identification on the register report. The "Security" registers are exhibited at the convention and the company's representatives will be pleased to explain their merits to all who are interested.

CONVENTION PROGRAMME.

Wednesday, October 17.

American Association.

10 00 A. M. to 12 30 P. M.

Convention Called to Order.
Address of Welcome by Robert Sheldon, President, Columbus Railway & Light Company; John Y. Bassell, Secretary, Columbus Board of Trade.
President's Address.
Report of Executive Committee.
Report of Secretary and Treasurer.
Address by Presidents of Affiliated and Allied Associations.
Announcements.
New Business.

2 00 P. M. to 4 30 P. M.

Reports of Committees.
(a) Membership.
(b) Compensation for Carrying Mail.
(c) Subjects.
(d) Car Wiring.
(e) Standardization of Equipment.
(f) Insurance.
(g) Promotion of Traffic.

Accountants' Association.

10 00 A. M. to 12 30 P. M.

Joint Meeting with American Association.

2 00 P. M. to 5 00 P. M.

Paper—"The Use of Curves in Statistics," by A. Stuart Pratt, General Auditor and Treasurer, Stone & Webster, Boston, Mass.
Report—Committee on Standard Classification of Accounts.
Election of Officers.

8 00 P. M.

Informal Reunion and Dinner.

Engineering Association.

10 00 A. M. to 12 30 P. M.

Joint Meeting with American Association.

2 00 P. M. to 5 00 P. M.

General Business.
Election of Officers.

Claim Agents' Association.

10 00 A. M. to 12 30 P. M.

Joint Meeting with American Association.

2 00 P. M. to 4 30 P. M.

Paper—"Methods of Management of Claim Departments," by H. C. Bradley, Adjuster, Chicago Union Traction Company, Chicago.
General Business.
Election of Officers.

The General Electric Company has in its exhibit a 12,000-ampere circuit breaker with remote control. With this is combined a main switch which is automatically operated in proper relation to the position of the circuit breaker by means of a small motor.

* * *

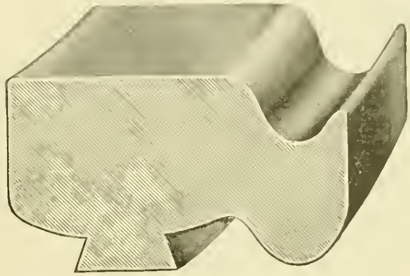
A unique booth is found at Section A, space 8, in Building 3. It is the booth of Dossert & Company, of New York, the manufacturers of solderless connectors for cables and wires. The frame surrounding this booth is made of cable wires joined by the firm's many styles and types of solderless connectors. H. B. Logan, president and E. A. Dossert, sales manager, are here.

* * *

The well-known Van Dorn automatic coupler will be found at the booth of W. T. Van Dorn Company, (Building No. 3, Section B, space 26.) Couplers for all classes of services are on exhibit here and Mr. W. T. Van Dorn is on hand to see his old friends and talk to all interested parties. He promises to complete his exhibit by adding a model all-steel freight car to it on Tuesday.

THE KEYSTONE BRAKE SHOE.

Every railway man appreciates that with the brake shoes in general use the proportion of metal in the shoes that is worn out in stopping cars is only from 40 to 70 per cent of the total in the new shoe, and at this time one of the objects sought by the standardization committees of the American and the Engineering associations is to determine upon a design of brake shoe that will reduce the scrap weight, and at the same time allow shoes to be interchangeable. By care in design the permissible wear of brake shoes can be greatly increased, and the weight when worn out correspondingly reduced.

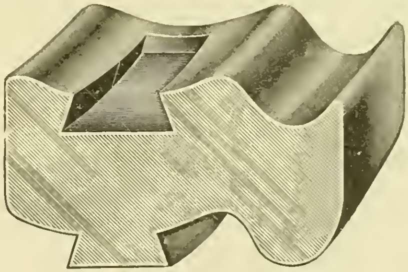


Section of Keystone Shoe—First Application.

The inventor of the Keystone brake shoe goes much further and presents a design that is intended to reduce the scrap weight to zero, in other words to make a shoe, absolutely all of which can be worn out in service. The Keystone shoe can be made of any metal desired, the advantages claimed for it on the score of safety, efficiency and economy being due to the design and not to the metal or process of manufacture.

The Keystone brake shoe, instead of being attached to the brake head by a single lug is held throughout nearly its entire length by means of a tapering tenon of dovetail or keystone section extending along the back of the shoe. This prevents the shoe from falling in event of a break occurring in service, and as the length of the tenon is eight times that of the lug or ordinary shoes the chance of accidents because of the broken shoes may be said to be reduced to only one-eighth of what it is in common practice.

The face of the Keystone brake shoe is made concave transversely as well as longitudinally and has lengthwise down the center a mortise of dovetail or keystone section corresponding to the tapering keystone tenon on the back of the shoe. The object of this is to permit the insertion of a partly worn shoe into the face of a new shoe, which latter then becomes the holder for the worn shoe until the latter is completely worn out. As the face shoe wears thinner and thinner the side edges of the new shoe, which holds



Section of Keystone Shoe—Continuous Application.

it, come into contact with the wheel, and as the wear progresses the surface of new shoe exposed becomes gradually greater, and after the original facing shoe is entirely worn out the former holding shoe becomes the bearing shoe, and when it is sufficiently worn it in turn is placed in the face of a new shoe. Besides eliminating the scrap question, this design does away with having to wear new shoes down to proper bearing; the Keystone shoe coming into service gradually by reason of the transverse concavity in the face.

The Keystone shoe is held in a brake shoe head designed to hold the shoe by the tenon on the back, just as a new shoe holds a partly worn one. Where it is desired not to immediately change the heads in use there can be used what is known as the Keystone intermediate brake shoe head; this is made of malleable semi-steel in two parts and takes a space between shoe and head of only ¼ to ¾ inch. The design has been worked out to make practicable the use of a standard shoe, which shall be perfectly interchangeable for the entire equipment.

The Keystone Brake Shoe Company has an exhibit at Space No. 18, Section B, Building No. 3, where representatives of the company will be pleased to show the Keystone shoe to those interested in brake shoes.

VACUUM PROCESS OF IMPREGNATING FIELD AND ARMATURE COILS.

The Standard Varnish Works has devoted a great deal of attention to the vacuum process of impregnating field and armature coils with insulating materials and the following description of the method for which we are indebted to this company will be found of much interest. The advantages of impregnated coils over coils treated in the ordinary manner with a solvent varnish are many. In the first place, ordinary cotton covering and fibrous material used in covering wire and the winding of coils carry in some instances as high as seven to ten per cent of moisture. In the ordinary method of dipping these coils into a cold varnish and afterwards drying the varnish under heat, the moisture is sealed in the coil, thus tending to lower the dielectric strength of the covering of the wire and cause an ever-present danger of burnouts. Another disadvantage in the ordinary plan of dipping coils into varnish is that the varnish penetrates but a few of the outside layers of the wire, thus leaving the inside layers of the coil bare of reinforced insulation which the varnish is supposed to give to the cotton covering.

With vacuum-treated coils, these conditions are reversed. After the coil is wound and taped, it is placed in a steam-heated air-tight chamber, which is connected through a condenser with the vacuum pump. The moisture in the cotton covering of the wire and the fibrous material used in the construction of the coils is vaporized at a comparatively low temperature and drawn from the chamber and condensed in a specially constructed condenser for this purpose.

The vacuum chamber, which is manufactured by the J. P. Devine Company, under the Emil Passburg patents, is so constructed as to secure a nearly perfect vacuum. It is possible to obtain a vacuum in these chambers within twenty millimeters of the absolute. Owing to these favorable conditions, the moisture and the air are quickly removed from the cotton and the fibrous material used in the construction of the coil and this leaves the coil in the very best possible condition to receive the previously liquified solid insulator used for the insulation of coils in vacuum. The time required for the drying and filling of coils varies from four to six hours, depending upon the depth of wire in the coils. The vacuum apparatus used consists in a closed vacuum chamber connected by piping with an open liquor tank. The liquor tank is supplied with large heating surface, steam being usually employed, and the solid insulator is placed in this tank and brought to a liquid state by means of heat. The coils in the meantime have been dried out in the vacuum chamber and the line connecting the two chambers is opened and atmospheric pressure forces the liquid compound into the vacuum chamber and over the previously dried coils. The line is then closed and air pressure of 60 pounds to the square inch is used to force the liquid compound into the cotton covering and between each turn and layer of wire in the coil.

The advantages gained in this way are numerous. In the first place, the moisture and air are exhausted from the coil, and the hot compound is thus allowed free access to the coil, and being filled in a vacuum, air, which is a very poor conductor of heat, is entirely excluded from the coil. The coils after having been filled are taken from the vacuum chamber and allowed to cool in the open air. There is no baking of the coils necessary as the drying of the compound is a cooling process, the material simply returning to its natural state. The coils are then ready for assembling. This process not only turns out a coil which is impervious to moisture, but provides a superior coil in other ways, the compound having cemented each turn and layer of wire in the coil, thus preventing abrasion of insulation and burn-outs from vibration, and also providing superior heat conducting properties.

Tests to determine the water-proofing properties of the material used have been carried on by operating the coils entirely submerged in fresh water for a period of one week and then in salt water for a further period of one week. The coils showed under this test absolutely no trace of leakage or breaking down.

The Standard Varnish Works states that it has perfected solid compounds designed particularly for use in impregnating railway motor field coils, armature coils and oil bath transformer coils. The impregnating compounds used for all classes of alternating and direct current coils which do not operate in oil bath are absolutely water-proof. The oil bath transformer compound is designed especially for use in connection with vacuum apparatus for the impregnation of transformer coils operated in oil bath. This latter compound is not only water-proof, but is proof against mineral oil used in oil bath transformers.

This company is the pioneer in the manufacture of compounds for use in connection with this apparatus and is today the only manufacturer furnishing commercially compounds for the filling of vacuum-treated coils.

In perfecting these compounds the company has installed a complete vacuum drying and impregnating plant of the Passburg system, manufactured by the J. P. Devine Company, of Buffalo, and has thus been able to work out on practical lines the compounds which it is offering to the trade for this purpose. This plant is at the disposition of the company's clients and the company will be glad at any time to demonstrate the desirability of impregnated coils and invites anyone interested in this method to send their coils, which will be impregnated free of charge and returned.

A great many electric railways are now installing steel trolley poles. In the purchase of this material they are generally guaranteed as good, serviceable poles. This would mean that if a pole were set up, and when subjected to strain, showed itself defective and unfit for service, the manufacturer would furnish another pole, but not bear the expense of labor necessary to erect it.

The Robert W. Hunt & Company bureau of inspection superintends the testing and shipment of such orders. On a recent order of some 1,700 poles, it is estimated that such inspection saved about $10,868, over and above the fee for inspecting. This amount is based upon the number of rejections in connection with the actual cost of replacement if the poor poles had been shipped to the railway company and does not include any estimate of loss due to delays.

PROCEEDINGS ACCOUNTANTS' ASSOCIATION.

The tenth regular annual meeting of the American Street and Interurban Railway Accountants' Association was called to order by President W. B. Brockway at 10:20 o'clock on Tuesday morning, who stated that it was hoped to have this convention called to order by the same gentleman who called to order the first meeting of the Association at Cleveland ten years ago, Mr. H. H. Windsor, then editor of the Street Railway Review, but a telegram received from Mr. Windsor advised that he would be unable to be present.

The minutes of the last convention were approved as published.

Mr. P. V. Burington, auditor of the Columbus Railway & Light Company, extended the hospitality of the convention city in the following brief:

Address of Welcome.

On this the tenth anniversary of our splendid association you have honored me with the great pleasure of bidding you welcome to the city of Columbus. To those who have been in our capital before, we bespeak a pleasant renewal of acquaintance, and to those who come for the first time, an acquaintance that may well be renewed.

So much good comes to the mind in the past work of this association that I cannot well omit a brief review. A decade ago last spring a few earnest railway accountants, by mutual agreement, gathered together at the Holland House in Cleveland to form an accountants' association. Very few of those present at that meeting are here today, but the spirit and numbers of that occasion have grown in magnitude and effectiveness each year, and the work but then feebly anticipated and outlined has grown to be of vital importance to the street railways of the country. The meeting at Cleveland was practically only that of organization, but the proposition was adopted that the association should meet annually at the same time and place as selected by the American Street Railway Association. Your itinerary since that time has been varied and broadening in its effect, the first annual meeting being held at Niagara Falls in the autumn of the year of organization, 1897. For the first time in your experience, perhaps, you met a great concourse of railway representatives and realized, in no small measure, the stimulating effect of being in close touch with all the forces that go to make up the present-day advancement of street railway service. You felt as though the great falls were yours by conquest, and that the mighty roar of its descending waters but echoed the might of your future endeavors.

Then to Boston, the good old Hub; one of the best meetings in your rounds, splendidly provided for and pleasantly entertained, with no omission of historic interest in the bill of fare.

On to Chicago, the giant metropolis of the great West, in which you mingled activity with its activity; great ideas, with its expectations; enjoyed its hospitality and came away with greater thoughts and intenser motives.

Then to Kansas City, a great populace, representing more forcibly than any other city in the far West the free spirit of its broad prairies, its wonderful products of grain, of stock and all the many things to swell the commerce and industries of the land. Not until you were again far away did you fully realize how much you had imbibed of this spirit of the West.

With your faces next turned to New York you felt at home and in your work and enjoyment came to appreciate more than ever how much this metropolis of the East has to do financially, constructively, theoretically and otherwise with the very problems you have in hand.

You suffered nothing in your visit to the stirring and beautiful city of Detroit, but rather came away satisfied with its hospitality and surprised at its advancement and accomplishments.

Saratoga Springs is a sweet dream in your memory; varied and abundant in its attractions, generous and hospitable in its social life, in every way a charming change in your itinerary.

The association was almost lost in the multitude of people at the St. Louis Exposition, but it did not lose itself. The work done was of the best and the additional experience derived from the wonderful exhibits will be a bright page in the retrospect of the past.

Philadelphia was the last stop in your wanderings, and no one desirous of seeing a genuine eastern city will find another place so much to his liking or so full of interest and benefit as this Quaker City. The one great thing accomplished here was the reorganization of all the elements making up the American Street and Interurban Railway Association and who shall say that much of the spirit that led to this is not the result of the broadening influence derived from your wanderings?

And now in the last period of the decade, you have come to Columbus, the capital city of Ohio. Out of modesty I refrain from using the common term "the great State of Ohio." You will find here a substantial and progressive people, possessed of well-used wealth; alert to the activities that make great cities; a people both generous and just in their dealings with men and ready to adopt new methods for the common good. Of its street railway system I leave you to judge. No city in the sisterhood of states more quickly steps to the front to welcome strangers to its gates than Columbus. And now let me repeat to you, on behalf of these people and on behalf of the Columbus Railway & Light Company, which I have the pleasure of representing in this convention, we most heartily welcome you; and with the earnest hope that the acquaintances you may make, the things that you may see, learn and enjoy will go with you from here and remain with you, as a memory of one of the most fruitful periods in your itinerary.

The Hon. W. Caryl Ely, president of the American Street and Interurban Railway Association, the parent organization, addressed the convention at some length and dwelt particularly on the subject of depreciation, endorsing unqualifiedly the action of the executive committee of the Accountants' association in placing this subject upon the programme, and he hoped for much practical benefit to be derived through its discussion.

President Brockway explained that Prof. B. V. Swenson, the secretary of the parent organization, who was upon the programme for an address at this juncture, was unavoidably absent owing to other engagements, but had signified his desire to attend a later session to address the convention.

President Brockway then read his annual address.

On motion of Mr. Frank R. Henry, of St. Louis, seconded by Mr. Fred E. Smith, of Chicago, Mr. H. C. Mackay, one of the ex-presidents of the association, was elected an honorary member thereof, in recognition of his long and faithful service to the interest of the association, preceding his retirement from the street railway field for the purpose of entering that of the steam railway business.

Mr. C. L. S. Tingley then submitted the report of the executive committee. This comprised a statement of the minutes held at New York in February and July last. The report included a statement of the policy of the association in regard to associate membership, and the communication addressed to the American association on this subject, to the effect that the Accountants' association did not wish associate membership in the American to carry with it associate membership in the Accountants'. It was the opinion of a majority of the committee that the association should authorize the sale of the standard classification of construction, and operating accounts, and of the standard form of report, and the price of one dollar per copy was suggested as a very proper one.

Pursuant to the recommendation of the executive committee, it was voted that the secretary be authorized to sell, at a price to be fixed by the executive committee, copies of the "Standard Classification of Accounts" and "Form of Report."

The report of the secretary and treasurer showed a membership of 263 at the present time, as compared with 152 at the last meeting. The receipts for the current year amounted to $1522.13. The balance on hand at the present time was $485.80. During the year the secretary had issued circulars numbered 39 to 43 inclusive. In concluding, the secretary requested that an effort be made to get several complete collections of blanks from smaller companies that could be used to send to new companies who were just opening their accounts, and desired to learn of the practice of other companies with regard to blanks.

The president announced the appointment of the following committees:

Credentials for Thursday's meeting: E. M. White, S. G. Boyle, W. G. McDole.

Resolutions: Frank R. Henry, C. L. S. Tingley, C. M. Corey, J. B. Hogarth, Charles Wight.

Nominations: F. E. Smith, H. S. Swift, P. S. Young, J. H. Neal, H. T. Bunn.

At the afternoon session, which was called to order by President Brockway at 2:20, Mr. H. M. Edwards, auditor of the New York Edison Co. and chairman of the committee on "Electric Light Accounting" of the National Electric Light Association, stated that he came to the convention representing that association in search of information in view of the reorganization which was now pending in connection with his association.

The president then introduced Mr. C. L. Judson, of the New York State Board of Railroad Commissioners, who also spoke briefly and expressed the pleasure it afforded him to be present at the meeting for the sixth consecutive time.

Mr. P. S. Young, the comptroller of the Public Service Corporation of New Jersey, read his paper on "The Accounting of Capital Expenditures," which paper and the subject in general were discussed.

Arrangements were made to have a photograph of the members taken at 12:50 p. m. on Thursday.

Mr. H. H. Adams, president of the Engineering association, addressed the convention briefly and said he desired to acknowledge the valuable assistance rendered by President Brockway in bringing about the co-operation of the engineering branch in the recent reorganization of the different associations.

The Question Box was then taken up, and the 19 questions therein contained discussed.

President Brockway then brought up the question of the advisability of continuing the Question Box in its present form stating that certain inquiries made by him as to the experience of other associations seem to show that this feature in the form in which it was generally maintained was proving unsatisfactory, in that it took from the convention proper the consideration of the questions propounded, thereby detracting from the interest of an oral discussion. He suggested that the questions might be sent out to members two months in advance of the convention, the answers to be given orally at the convention.

Mr. C. N. Duffy said he thought the matter could be safely left to the incoming administration to be handled, and no further action was taken on the subject.

Adjourned till 10 o'clock Wednesday morning, in joint session with the other associations.

CLAIM AGENT'S ASSOCIATION.

Tuesday Morning Session, October 16, 1906.

The Claim Agents' association was called to order by President Rhoades, pursuant to adjournment, at 10:00 a. m.

The first business was the reading of the paper by Mr. A. J. Farrell, claim agent, International Railway Company, Buffalo, N. Y., on the subject "Which is the Better Policy, Quick or Delayed Settlement?"

Mr Moore of New Jersey, opened the discussion on Mr. Farrell's paper, which was quite spirited and somewhat lengthy. Mr. Moore contended for quick settlements and stated that under the laws of New Jersey a release, in proper form, was binding and would estop the claimant from a further claim for damages. He maintained that a delayed settlement often worked to the injury of the railway company because it would be hard to keep its witnesses within the jurisdiction of the court. Many instances were cited by Mr. Moore and by Mr. Farrell, the result of the discussion of the question apparently being that after all it depended on the circumstances of the particular case as to whether there should be an early or a delayed settlement. Mr. Pierce spoke with reference to the condition of affairs at Galveston, Tex., and advocated in many cases a quick settlement rather than a delayed one.

Mr. Farrell made the interesting statement that during the Pan-American Exposition, in the course of four months, he settled two thousand claims.

The discussion then digressed somewhat from the topic treated of in the paper and related to the form of releases which should be taken in these quick settlement cases.

Mr. W. F. Weh, claim agent, Cleveland Electric Railway Company, then read his paper on "The Policy of the Claim Department Toward the Public."

The discussion on this paper was opened by Mr. G. Thomas Dunlop, of Washington, D. C., who commended very highly the sentiment expressed by Mr. Weh in his paper. He spoke of the inauguration of the claim department of the street railway system at Washington, D. C., and how under his direction the number of suits had been decreased until at the present time there were pending but nine law suits against his company.

Mr. Dorsey, of Denver, Col., stated that he treated all cases of injury as measured by the test of whether or not there was liability on the part of the company. If there was liability he endeavored in every possible way to secure a speedy settlement; if there was no liability then fight the case to the end.

Mr. Farrell stated that he believed that all just and fair claims should be settled for a reasonable amount. He stated that in Buffalo, out of 52 cases tried, in 42 of them the judgment was in favor of the defendant and that only 10 cases had been lost and in these 10 cases a verdict was secured for a less amount than they could have been compromised for before going into trial.

Mr. Weh, in concluding the discussion on his paper, stated that on January 1, 1906, there was pending ninety-six cases against his company.

Adjourned until 1:45 p. m.

Afternoon Session.

At the afternoon session the Claim Agents took up for consideration and discussion the Question Box.

Question 3 was discussed fully, President Rhoades stating that in Philadelphia, claimants had been indicted for perjury in connection with the pursuit of claims against the railway company for alleged damages, where they had sworn falsely, but in no case, to his knowledge, had there been a conviction for such offense, as jurors in criminal case would naturally give the defendant in such a case the benefit of a reasonable doubt.

A lengthy discussion followed the reading of Question 4, which was, "What is the best Way to Break up Ambulance Chasing?" The consensus of opinion seemed to be that this was one of the greatest evils that the claim agents have to contend with.

In the discussion following Question 8 it developed that it was the opinion of all of the claim agents present that in the settlement of a claim for damages against a street railway company, the claim agent should use no deceit whatever but that of of his methods should be honorable and open to public inspection, so that in the event of a suit on the claim, no charge could be made by the claimant's counsel of any deception or underhanded practice on the part of the claim agent in the adjustment or attempted adjustment of the claim. In no event should the claim agent fail to disclose his identity if it became necessary for him to deal personally with the claimant.

At 4 o'clock President Rhoades left to attend an executive committee meeting of the American association and the chair was assumed by Vice-President Bradley.

After the Question Box was disposed of a paper was read on the subject of "The Claim Agent's Work of the Future," by C. Willis Hare, United Gas Improvement Company, Philadelphia, Pa. This paper was read by Mr. H. R. Goshorn, he stating that Mr. Hare was unavoidably absent from the convention because of a very serious accident in the nature of an explosion occurring to his company and in which a number had been injured.

Mr. F. H. Johnson, of Bridgeport, Conn., was called upon to address the association with reference to the method employed by him and his company in the training of motormen and conductors on the subject of their conduct in case of emergency and accident, and he gave the members a very interesting talk along this line.

Mr. William DeMilt Hooper read a paper to the association on the subject, "The Relation of Statistical Bureaus to the Claim Agent's Work," which was followed by many inquiries and considerable discussion.

Adjourned to 1 p. m. Wednesday.

PENNSYLVANIA STEEL COMPANY'S SPECIAL WORK.

The works of the Pennsylvania Steel Company are located at Steelton, Pa., three miles below Harrisburg on the left bank of the Susquehanna River. The plant covers a space on the river front extending over three miles, and has 46 miles of railroad track having direct connections with the Pennsylvania, the Northern Central, the Philadelphia & Reading and the Cumberland Valley railroads. This plant includes blast furnaces, Bessemer and open hearth furnaces, rail mills, slab mills, billet mills, steel foundry, bridge and construction works, and what is believed to be the largest frog and switch works in the world. The concentration of so many separate branches of the steel industry enables the company to manufacture finished steel through all processes from the receipt of the crude ore, and to have its product unsurpassed. The plant is thoroughly equipped with electric power, several of the departments having their own substations with the latest types of transformers.

The bridge and construction department is thoroughly equipped for handling any class of structural work, among its notable achievements being the Niagara Arch, the Williamsburg Bridge, the Blackwell's Island Bridge in New York, and the Gokteik Viaduct in Burmah, British India.

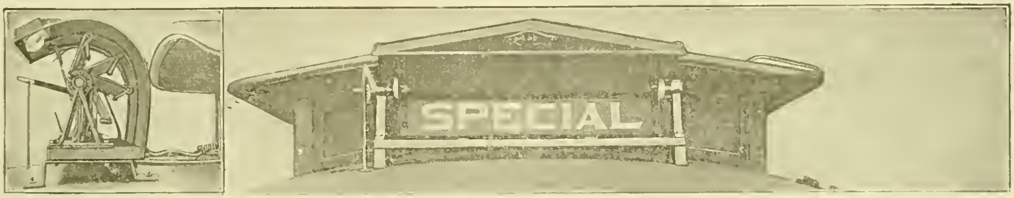
The frog and switch department covers 25 acres of ground, of which 10 acres are covered by buildings. This department's product is of the highest class of material, millions of pounds of "Manard" steel being used yearly for product subjected to excessive wear. "Manard" steel, after numerous experiments, has been found a superior material for use in track work, and enters into the construction of "Manard" frogs for steam and interurban service, "Manard" crossings for all services, rapid renewable "Manard" hard center frogs for street railways and steam railroads in paved streets, and big pin switches for all services. The great railroad systems are making very extensive use of the "Manard" frogs, finding them most economical, especially for the points of heaviest wear, and interurban line railroads should appreciate the advantage of such material for their open track. The rapid renewable "Manard" hard center frog for use in paved streets was adopted after many experiments, and meets the requirements that the renewable center be of such design that the renewal can be effected without removing the street paving, and that it can be tightened without the necessity of respeltering the center. In tongue switches the effort has been to produce a durable switch; one in which there was a minimum of danger of the tongue shifting during passage of a car. In this switch, all wearing surfaces, including the tongue, are of "Manard" steel, and through the use of a 5-inch pin and an efficient tightening device working thereon, danger of shifting under traffic is eliminated, and through the bottom bearing given this pin on a plate of "Manard" steel, the depression of the heel of the tongue is largely avoided.

In switch stands, improved standards are manufactured of more or less expensive design, from the ordinary ground lever to the semaphore stand, a new departure in signaling devices, which conceals the semaphore target automatically with setting the switch for main line. For interurban use the company specially recommends this stand with a low or intermediate target, type 50-E. The New Century switch stand, type 50-A, is reported to be proving its popularity by continuous and greatly increasing demand.

NEW DESTINATION SIGN.

The accompanying illustrations give some idea of the F. & B. Destination Sign, a patented device which is now being placed on the market by the McLeer Engineering Company, 340 Pearl street, New York.

Only one incandescent lamp is needed to illuminate the sign and with this located in front of the drop under the hood of the sign it sheds an even light, free from "light" and "dark" spots on the lettering. The hood and the sign drops are made of galvanized iron which will not rust. This device is self-contained and therefore on roads using them no loose signs are left lying around the car houses. The drops are attached to a hub on a shaft which is revolved by a single pull on a lever that projects through the bonnet of the car. Eight or twelve drops can be used, making 16 or 24 signs, if lettered on both sides.



F. & B. Destination Sign.

This type of sign has been adopted by the Interborough Rapid Transit Company of New York and the New York Queens County Railway Company of Long Island City.

Among the products which the W. T. Van Dorn Company expects to exhibit is a model of its new design for an all-steel box, baggage, mail or express car. In designing the framing of this car body, especial care has been taken to so dispose the material as to assure that the car will withstand very heavy shocks.

* * *

A new form of truck bearing is being shown by the Lumen Bearing Company, of Buffalo, N. Y., at its exhibit in Building 2, which will be of special interest to any electric railway manager who has been troubled with hot journal-boxes. An oil-pocket is provided at the lower edge of the new bearing which keeps a supply of oil under pressure constantly on the bearing and insures a more perfect lubrication than can be obtained in the old way. A practical demonstration of this is shown in the exhibit of a model journal-box, which will be explained by Mr. Sharp and Mr. Stimpson, who are in attendance.

THE CLAIM AGENT'S WORK OF THE FUTURE.*

By C. Willis Hare, General Claim Agent, The United Gas Improvement Company, Philadelphia, Pa.

The success of the claim agents work of the future will depend very largely on what is done for him, as well as what he does for himself. In other words, unless certain legislation is enacted, a large part of the efforts of the claim agent in making prompt and low settlements, in fighting where a fight is advisable, and in compromising where a compromise is to the best interests of his company, cannot meet with the success it deserves.

While in certain respects it is astonishing with what rapidity the claim business of the country has grown within the last few years, when one considers the forces which have been at work to this end, it is even more astonishing that the accident business has been confined within any reasonable limits in any one of the larger eastern cities. There is little question that if a corporation were enabled to settle its just liabilities in an accident case on a basis considered equitable by a body of fair-minded and impartial citizens, the total sum paid in any given year would be an astonishingly small one compared with the amounts paid today; but this is not the case, and the records of all large traction companies today tend to prove that the heavy expenditures of the claim department are not made necessary by serious injuries due to the negligence of the company, nearly as much as they are made necessary by that type of case which, starting with a minor injury, or no injury at all, is worked up with extreme cleverness by the unscrupulous claimant, aided by equally unscrupulous physicians and attorneys. It is this type of case that is the source of constant worry to the claim agent, and I doubt not will continue to be the source of worry for many years to come.

While nearly every claim department today is fighting this particular evil through a well trained corps of adjusters and detectives, it can only be permanently relieved through the enactment by our legislature of certain laws tending to make the perpetration of a fraud far less easy of accomplishment than the laws of today permit of. Some little work has already been done in this direction, but in order to secure a successful outcome, it will be necessary for the various traction companies in every state in the union to combine in a united effort in their respective states to force upon the notice of their state senators and representatives, a general idea of the evils as they exist in this branch of the claim business today, and unless some measures are taken for relief, one may expect to find a gradual increase in the cost of the accident business in the eastern cities, and a very marked increase in the western cities, where at the present time the spirit of graft has not entered to the alarming extent which it has reached in the east, due largely to two reasons: First, that the western public is not fully aware of the advantages to be secured through fraudulent litigation, and have not been sufficiently educated along these lines by unscrupulous attorneys and physicians. Second, that the larger proportion of emigrants have chosen to settle in the east rather than in the west, and it is the foreign element in every city which has identified itself more closely than any other element, with the fraudulent bringing of claims.

The first act to be urged upon the legislature should be one making it a criminal offense for an attorney to advance money for the maintenance of a suit. If this were done, a large number of cases which are carried to a successful conclusion today would fail, owing to the claimant's inability to remain away from work for the period necessary to successfully maintain a fraudulent suit.

A law should also be passed making a claim invalid unless written notice be given the corporation within thirty days from the date of the accident, and the statute of limitations should be so changed as to make one year the time limit in which a suit may be brought.

An act should also be passed making it compulsory to try with the main issue of a case, all actions for loss of service of wife or child.

Some of these statutes exist today in certain states, but they should exist in every state, and when they do, I am convinced they will result in a very material saving to all claim departments, and no disadvantages to plaintiffs with just causes of action.

Today, nine men out of ten believe that the accident business is only one form of corporate activity to secure much for little. They believe the claim department to be composed of a band of adjusters endeavoring to dupe the poor and obtain settlements from them for grossly inadequate amounts, or rather they take this general view of the situation for granted, without having given the subject any thought whatsoever They do not believe you when you tell them the large majority of cases settled, are settled for sums far in excess of the amount which would compensate the individual for any time lost, or suffering caused by an accident, and will not realize that such sums are only paid because of the knowledge that unless paid, an unjust verdict of an unfriendly jury for a far greater amount, may be sustained by the highest court in the state.

It would therefore seem advisable to draw the attention of the people of your community to the real nature of the claim work by publishing from time to time in the newspapers, stories covering different sides of the work. If this is done, little by little, you will find the leaven working in your favor, and it will not be long before your legislature will be enacting the statutes mentioned.

I personally know of a town of some 200,000 inhabitants, where the traction company had been preyed upon for years by an unscrupulous set of attorneys, doctors and claimants, whose actions were considered perfectly justifiable by the better class of attorneys, as well as by the better class of business men. In several instances, men of prominence were brought to the office and shown some of the cases, which, starting from practically nothing, had through the clever manipulation of lawyer, doctor and claimant, been worked up to a point where the injuries were apparently of a permanent and most serious nature, and where thousands of dollars would be required to effect a settlement, where hundreds should have sufficed. They were astounded; they spoke of what they had learned to their friends. Some of the very attorneys employed to fight the cases, had previously had no experience in accident work, and were equally thunderstruck by the amazing amount of graft which was constantly being disclosed to them while preparing their cases for trial. Little by little, the impression gained ground that the corporation was not such a grinder of the poor as had been formerly believed; the difficulties that beset the claim department were more thoroughly understood, and the company is seeing today a gradual change of opinion which is helping materially in its settlement. This then should be one branch of the claim agent's work of the future, if he hopes to hold expenditures down to a reasonable basis.

The claim agent's position fits him peculiarly to look on both sides of traction work, the commercial side as well as the operating side, and his suggestions along lines of operation should be given a fair hearing, even although they may be against the personal opinion and wishes of the superintendent. If, for instance, the operating department increases the speed on a certain division, the claim agent finds that due to this increased speed he is having a larger number of accidents, and that these accidents are costing the company more money than is being saved the operating department in its platform expense, then the proper course would seem to be to return to the slower schedule. Again, if the claim agent finds that accidents are becoming more frequent through allowing passengers to ride on the seat directly behind the motorman, thereby distracting his attention, the fact that the company may be receiving a greater return in money than is being expended by the claim department on account of accidents arising from this cause, should not be permitted to influence the company in their decision to remove these front seats, or where this is impracticable, to chain off the front platform from the possible invasion of passengers. If a motorman is to be held strictly responsible for the proper running of his car, it is advisable to remove every possibility of having his attention distracted through the presence in his immediate vicinty, of personal friends or acquaintances.

There are certain changes which I feel must eventually be made if the cost of the accident business is to be materially decreased. The most important change in my opinion, is the abolishing of the present type of open car, and the substitution of the type of car with a central aisle, and entrances at either end. I think we all find that running board accidents form a very large portion of the total number occurring during the summer season, and while it may be difficult today to convince the management of a traction company that open cars should be abolished, I believe it to be one of the most important changes which the next few years will bring about.

Another and very serious difficulty with which the claim department has continually to deal, is the type of men employed as motormen and conductors. The present class of men in these positions is infinitely inferior to the class employed a few years ago, and is made up generally of men who seek these positions as a temporary means of support while looking around for something better; this in spite of the fact that the wages paid have been constantly increased. I believe, however, that it would pay to increase the wage of the newly hired employe, who when first employed today is put on the extra list by establishing a minimum wage per day, which wage shall be something less than he would receive if he had a regular run.

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*Read before the American Street & Interurban Claim Agents' Association, Columbus, O., October 16, 1906.

These suggestions, if put into effect, will undoubtedly increase the expense of operating the road, but the money saved in the claim end of the business will more than make up for the additional cost.

Let us hope, therefore, that the claim agent's work of the future will result in bringing about these changes; the education of the public to the true inwardness of the claim business and their subsequent denunciation of its fraudulent side; the enactment by our legislatures of the laws suggested in this paper and the co-operation of the operating departments in making certain changes which will be of undoubted benefit to the claim department, as well as the company as a whole.

FUEL ECONOMIZERS AT THE SPRING STREET POWER STATION, COLUMBUS RAILWAY & LIGHT COMPANY.

The Spring street power station of the Columbus Railway & Light Company, Columbus, O., contains two 1,000-kw., one 850-kw. and two 500-kw. direct-current generators driven by Green-Wheelock, cross-compound engines, also two 500-kw. alternating-current turbo-generators supplying current for lighting. Steam at 175 pounds gauge pressure is supplied by four Babcock & Wilson boilers, connected to a brick stack and five similar boilers served by mechanical draft fans. Four more boilers, which are to be connected to the mechanical draft fans, are being installed.

Each of the four boilers connected to the stack contains 168 tubes, 4 inches in diameter and 18 feet long. There are also two 42-inch drums, 23 feet 3⅝ inches long, so that the total heating surface in each boiler, assuming that half of the cylindrical surface of the drums is in contact with the hot gases, is 3,424 square feet, equivalent to 311 hp. at a rating of 11 square feet per horsepower, or of 342 hp. on a 10 square foot rating. These four boilers have Dutch ovens, two at present fired with gas and the other two hand-fired with coal. The brick stack drawing the gases from these furnaces is 203 feet high, including a 50-foot extension added a short time ago. In spite of the gas firing and the Dutch ovens in connection with the two boilers using coal, there is considerable smoke. Between the boilers and the stack is a Green fuel economizer of 600 tubes, aggregating 2,200 square feet of heating surface, or a little more than 50 per cent of the boiler surface with which it is connected.

The mechanical draft part of the plant at present comprises 2,100 boiler horsepower, although boilers now being put in will bring this up to 3,500 hp., for which capacity the fans were designed. The furnaces of these boilers have traveling chain grates and although the same coal is burned as in the Dutch ovens with natural draft, coarse slack, costing about $1.25 per ton, there is not a trace of black smoke from the short funnel, reaching just above the roof, into which the fans discharge.

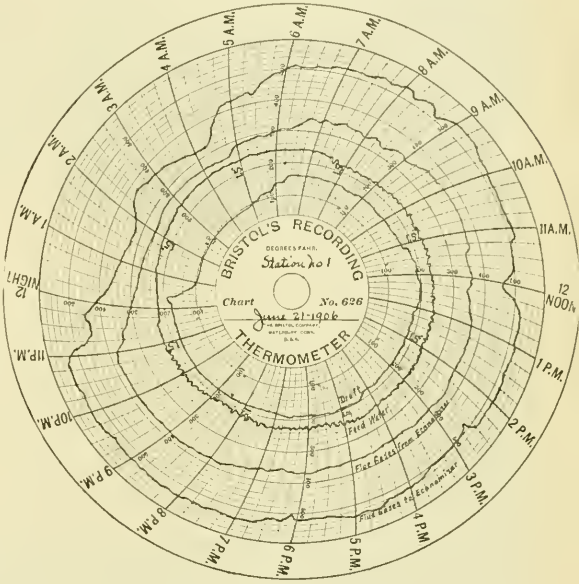
The fans were supplied by the Green Fuel Economizer Company, of Chicago, Ill.

As they are located in the main engine room, the housings are covered with magnesia plaster to prevent radiation. The overhung wheels measure 18 feet by 6 feet and are driven by center-crank engines, the two water cooled fan bearings for each wheel being supported on the engine foundations. A small door in the front of the housing gives access to the wheels, and at the rear of the housing is a sliding damper which shuts off either fan as desired, one standing as a "spare." Similarly, there is a two-way butterfly damper in the discharge passage operated by a hand wheel in reach of the engine-room floor.

Recording gauges register the draft and recording thermometers register the temperature of the flue gases on the suction side of the fans. The draft is regulated by varying the cut-off of the engines while running by means of a hand wheel which shifts a block in a link of the valve gear. There is, besides, a throttling governor to prevent the engine from racing accidentally. This method of varying the draft by varying the cut-off of the engine is more economical of steam than regulation by throttling either the engine or the draft.

Between the fans and the boilers are two Green fuel economizers one of 300 tubes and one of 600 tubes or 10,800 square feet of economizer surface altogether, which is about 78 per cent of the boiler surface. Recording thermometers register the temperature of the water on entering and leaving the economizers and the average rise in temperature of the feed water with the present boiler capacity is about 90 degrees F. The water fed to the boilers is measured by a water meter.

The main engines exhaust into a Wheeler surface condenser, the exhaust passing through a Cochrane oil separator on the way. It is stated that in this way 99 per cent of the oil is removed, and although the condensation is returned through open feed-water heaters, receiving the exhaust of the pumps and fan engines directly to the boilers, no traces of oil have appeared in the latter, which are cleaned every 60 to 80 days. The condenser circulating water is taken from the Scioto river and after leaving the condensers discharges into an overflow tank from which the "make up" for the boilers is drawn.

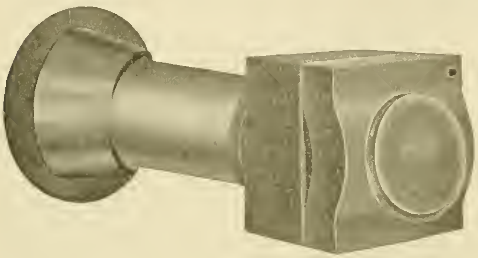


Green Fuel Economizer—Card Showing Temperatures of Flue Gases to and from Economizer.

A chart for June 21, 1906, from one of the Bristol recording thermometers is shown herewith, the records from other charts being superimposed, so that the one diagram shows for simultaneous moments, (1) the temperatures of the flue gases entering the economizers, (2) the temperature of the gases leaving the economizer, (3) the temperature of the feed water leaving the economizer and entering the boiler, and (4) the intensity of the draft in inches of water. It will be noticed that the gases leaving the boilers are above 500 degrees practically all of the time except from midnight to 6 a. m., and that the economizer reduces this temperature by 150 degrees on the average. The mean of the feed water thermometer readings is 227 degrees, although the actual average temperature of the water cannot be stated in the absence of hourly readings of the water meter. As the average temperature of the feed water entering the economizer from the heaters is about 150 degrees, this corresponds to an average rise of temperature of about 75 degrees, which in turn indicates a fuel saving of 7 per cent. The average hourly evaporation from the boilers served by this fan is 63,000 pounds of water, which would indicate, roughly, that the economizer pays a yearly return of 43 per cent upon its first cost. When the enlargement of the boiler plant is completed the economizers will, of course, show a greater annual return. This is only the theoretical saving due to the rise in temperature and does not credit the economizer with the fact that due to having to burn less coal on the grates, better furnace conditions are obtained and that, by reason of the fan, good combustion is obtained with a cheap grade of coal.

THE GRIP NUT.

The Grip Nut Company has been manufacturing for two years a simple device, which is a successful substitute for the lock nut. It is not a spring nut nor a jamb nut, but it locks itself upon the bolt thread. As will be seen in the illustration, the grip nut is less than one-half the thickness of standard nuts for corresponding diameter of threads, and it is made with an arched section at the thread portion. Bars of steel of this section are rolled in lengths about twenty feet long and the grip nuts are sheared and punched at one operation by automatic machinery. After the nut is threaded it is run through a press, which indents the thread at the crown of the arch. The deflected threads are driven out of their normal plane and the pitch of the two upper threads is changed, causing them to bite upon the bolt and the nut locks itself regardless of its contact with the main nut. When a nut thus made is screwed onto the thread it has a constant tendency to lock itself upon the bolt, and hence it is called a grip nut. Nuts of this kind have been tested in severe service and have fully demonstrated their usefulness and effectiveness as well as their simplicity. The first factory was established at Oak Park, Ill., and the business has grown so that a larger factory has been built at South Whitley, Ind., near Fort Wayne.



The Grip Nut.

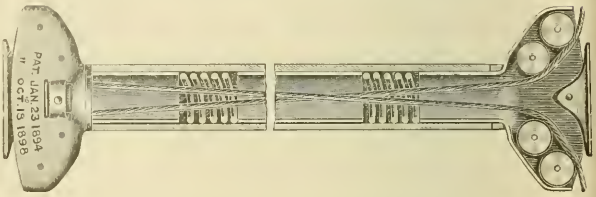
This building is 66x250 feet and has a capacity of nearly 300,000 nuts per day. The grip nut has been used extensively on electric railway tracks and trucks and also in the severe service of crossing frogs, as well as the track joints of steam roads. It is also used extensively for securing the nuts on column bolts of diamond freight trucks.

The nut has been in successful use so long that the company now feels safe in offering to its customers a bond, in which it agrees to pay $1.00 each for every grip nut that fails over and above one per cent, or which fails to stay upon a fully-threaded bolt when properly applied and to hold the main nut secure upon the bolt for one year in the usual service on rolling stock, tracks, frogs or crossings.

In addition to its capacity to obtain and hold absolutely tight nuts on bolts on track joints, crossings, switches, electric gear cases, split gear, motor axle bearings, armature bearings and various nuts or trucks and cars, the nut has the advantage of extreme simplicity and it is inexpensive. It can be removed by a wrench and used many times over. It requires no special thread, hole, slot or other change in the standard bolt and it does not injure the thread in any way. The grip nut does away with jamb nuts, spring washers, cotter pins, keys and other similar fastenings. The offices of the Grip Nut Company are at 152 Lake street, Chicago, and 500 Fifth avenue, New York City.

CABLE CURTAIN FIXTURES.

The Curtain Supply Company, of Chicago, manufacturer of the "Cable" and other curtain fixtures for open cars, is exhibiting the type of fixture shown in the accompanying illustration, together with several other types for semi-convertible and open cars. As shown in the cut-away view the shoe at the end of the tip in the cable fixture is held against the bottom of the grooves by spring pressure. This assures that the fixture will hold itself at any desired position in which it is placed and at the same time permit the cables to be strung loosely, thus increasing their life which is a very desirable feature as regards maintenance.



Cut-Away View of "Cable" Curtain Fixture.

WESTERN ELECTRIC COMPANY'S NEW PLANT AT HAWTHORNE.

The Western Electric Company has been engaged in the manufacture of electric light and power apparatus since 1882 and within 20 years the business had so outgrown the old plant that it was necessary to secure a location where more room could be provided and where direct railroad facilities were available. In 1901 a tract was purchased at the extreme western side of the city of Chicago and the construction of the new shops was commenced. The works now consist of the following principal buildings: Offices, pattern shops, storage buildings, foundry, forge shops, machine shops and rubber plants. There is also a gas plant, water tower, power plant, crematory buildings, freight house and a round house. Each of the above buildings is of fire-proof construction.

The office building is 160x51 feet in area and three stories in height, with provision for an additional two stories. Immediately adjacent are the pattern shops and pattern storage buildings. The pattern storage building is 220 feet long by 53 feet wide and two stories high. Provision has also been made here for additional stories. The foundry is a brick and steel structure 400x176 feet and 75 feet high and contains two 30-ton cranes. The machine shop, situated near the foundry is 860 feet long and 130 feet wide. This building contains two 30-ton cranes and five 20-ton cranes.

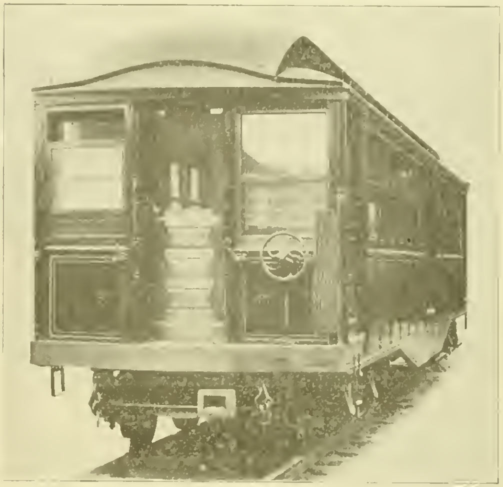
The boiler-room has an area of 20,700 square feet and contains eight Aultman & Taylor boilers with a heating surface of 5,080 square feet, arranged so that a superheater may be installed at a later date. Aultman & Taylor chain-grate stokers are used. The engine-room and condenser pit have a total floor space of 16,000 square feet and contain a power plant of capacity for continuous service of 3,000 kilowatts. There are four units, one each of 300, 500, 1,000 and 1,200 kilowatts capacity. The condenser pit contains three Wheeler surface condensers and three Blake duplex single-acting air pumps. The engine-room also contains a 20-ton crane and a 5-ton auxiliary hoist and a 15-ton crane. All of the machinery in the entire plant is electrically driven. The larger generator is driven by a vertical cross-compound Rice & Sargent engine. The 300 and 500-kilowatt generators are driven by horizontal cross-compound engines and the 1,000 kilowatt by a vertical cross-compound. The main switchboard located in the gallery in the engine-room consists of eighteen 30x78-inch marble panels. The switchboard is so arranged that 550 volts may be available for testing purposes.

Compressed air is used for the purpose of operating pneumatic tools. All of the buildings are heated by direct radiation except the foundry and machine shops, the foundry being equipped with the hot air system while the machine shop has a combined direct-radiation and hot air system. The various buildings are connected with the power house by a system of well-lighted and ventilated tunnels in which are located the telephones, lighting and power cables and pipes for water, compressed air and steam. These tunnels have a uniform height of 7 feet and are from 4 to 10 feet wide. Careful attention has been given to the fire hazard and an engineer devotes his entire time to the fire-protection devices.

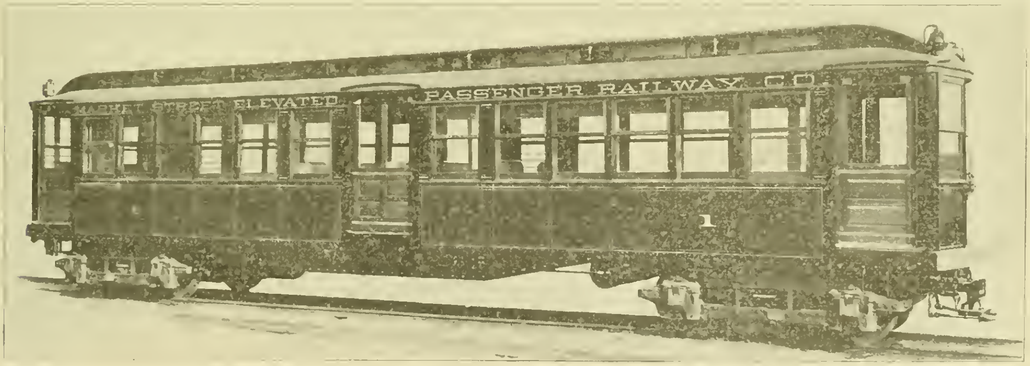
ALL-STEEL CARS.

The advantages as to strength and safety in operation offered by steel car construction are receiving increased attention from railway officials, with the idea of extending to the passenger car field a form of construction which has demonstrated its value in connection with freight cars. While in some isolated cases cars for the transportation of passengers had been built of steel wholly or in part, the announcement some eighteen months since of the plan of the Pressed Steel Car Company of Pittsburg, for the erection of a modern plant to be devoted exclusively to building all-steel and composite steam railway passenger equipment, street and interurban cars, may be called the first step toward this end in a really commercial sense. In accordance with this announcement, buildings were put up as rapidly as possible and all available capacity thereof for several months ahead was early contracted for.

The Pressed Steel Car Company defines the passenger cars designed and constructed in this plant as cars which while conserving the external contour or appearance of the usual wooden car, are constructed entirely, or for the greater part, of steel-plates, pressed shapes and commercial sections, making a vehicle of extreme rigidity which couples lightness with great resistance to the shock of collision, fire or other accident. The first car turned out of the new plant was completed in the early spring of the present year for the United Railroads of San Francisco, and was an all-steel street car of the California type. As this car has dimensions corresponding to a wooden car of the same type, it requires a practiced eye to distinguish it from the latter. This similarity of external appearance was effected by covering practically all the rivets on the outside of the car body with special drawn mouldings and graining all the steel parts such as posts, panels, etc., to conform to the ordinary wood finish.



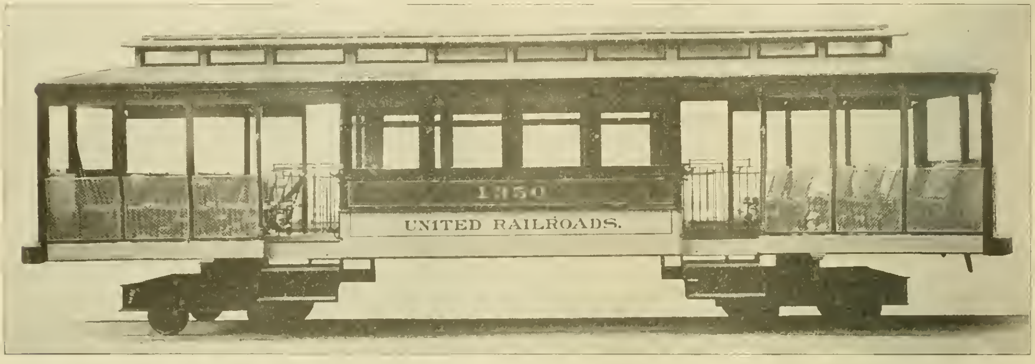
Pressed Steel Cars—End View of Cars for Philadelphia Rapid Transit Company.



Pressed Steel Cars—Side View of Cars for Philadelphia Rapid Transit Company.

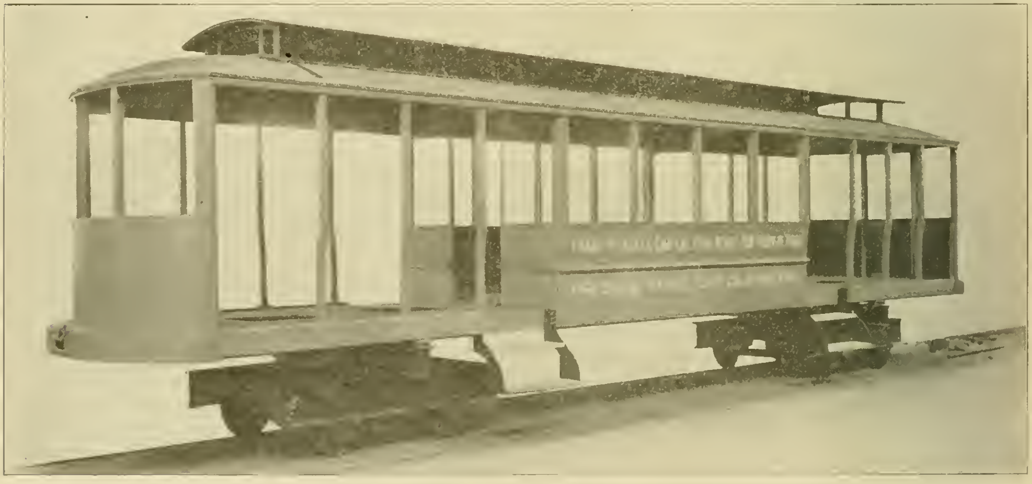
The California type of car, which is one adapted to the climatic conditions of that part of the country, has open sections at each end with a closed section in the middle, this forming a satisfactory construction for service the year round. The accompanying half-tone illustration gives a general view of the car, which seats 40 persons and has general dimensions as follows: Length over all, 40 feet 6 inches; length over closed part of car, 13 feet 2 inches; distance from center to center of trucks, 23 feet 6 inches; width over side sills, 7 feet, 10½ inches; width over side sheets at belt rail, 8 feet 2¼ inches; height from top of rail to top of roof, 11 feet 5½ inches.

The underframe, the side sheets, the outside finish to eaves of closed section of car, and the platform posts in the open sections are made of steel in form of plates, rolled or pressed to suit the requirements. The interior finish, such as doors, window sash, floor mats and deck mouldings are made of wood. The floor is made of 3/32-inch steel plate with one course of wooden flooring; the lower and upper deck ceilings consist of steel sheets. The carlines and purlins are made of rolled angles. In the underframe the center sills are of 6-inch rolled channels, the side sills built up of Z-bar and pressed angle plates and the bumper of 8-inch rolled channel pressed to shape.



Pressed Steel Cars—California Type for United Railroads of San Francisco.

In order to carry the load and weight of car entirely on the side construction, care had to be taken in providing openings for steps next to the closed section between trucks without weakening the car at these particular points. This was successfully worked out by placing reinforcing angles along the side of the step opening extending past the body bolster. The longitudinal seat supports in the closed section are built up of steel plates and angle construction. The body bolster is made of steel truss construction, and to take Peckham 14-B-3S trucks, with 33-inch wheels.



Pressed Steel Cars—Frame of California Type for United Railroads of San Francisco.

The equipment includes the following specialties: Wood's patent standard gates; "Walkover" cross seats in open section; longitudinal rattan seats and backs in closed compartment.

The next cars built by the Pressed Steel Car Company were three steam railway passenger coaches for the Southern Railway, all of which have been delivered and forty all-steel passenger car bodies for the Philadelphia Rapid Transit Company, the greater part of which have now been completed and delivered. The trucks for the latter were built by the Tate Manufacturing Company and applied by the railroad company.

One of the Southern Railway coaches was exhibited at the conventions of railway mechanical officials at Atlantic City in June, exciting much interest and favorable comment at that time. In these cars the purchaser desired wooden finish above the window rail, but the framing of the car throughout is of steel, the vestibules are all-steel and also the outside sheathing to window rail of steel plate.

Of particular interest at Columbus, however, is the type of car built for the Philadelphia Rapid Transit Company. These forty cars are for service on the Market street elevated and subway line, and the reproductions from photographs herewith give an idea of the pleasing appearance of the car. The design is of steel throughout with flooring of a non-combustible composition, and it is to all intents shock and fireproof. The outside sheathing is of cold rolled steel and the underframe consists of deep fishbelly side sills, with crossbearers and connections, in girder form.

The general dimensions are as follows: Length over platform (over all), 49 feet, 7¼ inches; length over door posts, 40 feet, 6¼ inches; length inside of car (end lining), 39 feet, 6¼ inches; width of car outside of side sheets, 8 feet, 7 inches; width of car inside, 7 feet, 7¾ inches; height from rail to top of floor, 3 feet, 10 inches; height from floor to ceiling-center, 8 feet, 6½ inches; height from rail to top of car, 12 feet, 7 inches; opening for vestibule side door (between door posts), 2 feet, 9 inches; width of end door opening, 3 feet, 2½ inches; width of center door opening (side), 3 feet, 4 inches; distance from center to center of trucks, 34 feet, 6 inches; width over eaves-upper deck, 5 feet, 6¾ inches; width over eaves-lower deck, 8 feet, 5⅝ inches; width of vestibule and door opening, 2 feet.

Pressed Steel Cars—Interior View of Cars for Philadelphia Rapid Transit Company.

The details of equipment and interior fittings include: Westinghouse automatic air brakes complete with Westinghouse D2 compressors; also automatic air couplers; bevel geared vertical hand brakes on each end of car; twelve car-lines per car of 1½-inch by 1½-inch steel; Van Dorn coupler and draw bar; pantasote curtains with Forsythe ring fixtures No. 48; mahogany doors, lower half panelled and upper half with one light of ¼-inch plate glass (the side doors and those at the center are arranged for opening and closing by pneumatic devices from either end of the car); elastic strikes for the vestibule side and center doors; 25 single electric light fixtures, one headlight and two markers on each end; complete system of electric heating and apparatus for power for control; corrugated steel sheets covering underframe and Monolithic flooring composition; interior finish of straight-grained mahogany; two motormen's cabs on each car, at diagonally opposite corners, right hand side; roof of tongue and groove poplar ½-inch thick and covered with 8-ounce cotton duck; safety chains, two on each end equipped with 4-inch diameter springs; pantagraph safety gates applied on platform corners opposite motormen's cabs; Mason safety treads at each end door; four longitudinal seats for nine persons each and eight cross seats in center of car for two persons each; 12 pairs standard automatic ventilators; 24 side windows per car, 18 of which have upper sash movable and lower sash stationary. The cars are painted Tuscon red with gold stripes.

Pressed Steel Cars—Interior of Coach for Southern Railway.

Storage Battery Patent Decision.

The Gould Storage Battery Company advises us that October 1, 1906, an important decision was made by Judge Hazel in the United States Circuit Court for the Southern District of New York, relating to regulating storage batteries, such as are employed in power plants and at sub-stations. The suit was one brought by the Electric Storage Battery Company of Philadelphia against the Gould Storage Battery Company of New York, alleging infringement of the patent to Mailloux No. 430,868, of June 24, 1890. The alleged infringement was the system regularly employed by the Gould Storage Battery Company in which the battery booster has its field automatically regulated by a counter machine whose electro-motive force is in turn regulated by the current fluctuations of the main generator or generators. One of the Gould installations had been installed in the power plant of the Lexington & Boston Street Railway Company of Lexington, Mass., and the testimony in the case related to this particular plant. The Electric Storage Battery Company had, for a long time, claimed that the Mailloux patent is a fundamental patent covering all the automatic booster plants installed at central stations, and besides that, against the Gould Storage Battery Company, a number of suits have been begun on the same patent against purchasers of the Gould Storage Battery Company's system. The complaint claimed infringement of seven claims of the patent, but at the hearing withdrew all but two of them—claims 2 and 6. The Mailloux patent described the regulation of the booster by the fluctuations of the working circuit and showed the field winding of the booster in the working circuit, so that it would be subjected to all the fluctuations on the trolley line. Judge Hazel held that a prior system, described by Lane Fox in a very early patent, contained all the elements of this system except only the particular location of the regulating coil, and that the only novelty of the Mailloux patent, therefore, resided in so connecting and locating the prime regulating coil for the booster that it would control directly and completely by fluctuations of current in the working circuit. The court held that the regulation of defendant's counter machine by a field winding in the circuit of the generator involves a different principle and produces a different kind of regulation and distinct results and summed up by saying: "My conclusion is that the claims cannot be given a scope to embrace a booster automatically regulated by a coil in the generator circuit when such regulation occurs by the conditions of such circuit. It follows that the defendant's system cannot be included in the scope of the claims in suit and its means of regulation do not correspond to those of complainant, nor do they produce the same result." The court also said: "In the defendant's device, which is constructed under the Hubbard patent, No. 651,664, dated June 12, 1900, the regulating coil is in the generator circuit between the generator and the battery and is affected by that circuit and not by the fluctuations or variations of the working circuit."

IN THE EXHIBITION HALLS

The St. Louis Car Company announces that it has acquired exclusive rights to build semi-convertible cars in which windows are carried overhead as covered by the patents issued to John O'Leary, the validity of which was upheld by the United States Court of Appeals in the case of John O'Leary and others, complainants, appellees, versus Utica & Mohawk Valley Railway Company, defendant, appellant.

* * *

The big white button which so many convention guests are wearing is given out by the Van Dorn & Dutton Company, at its cozy corner in Building 3, Section B, and entitles the wearer to a drink, a smoke, or a souvenir at any time. The cigars are good, the drink is ice-water, and the souvenir is a handsome leather memorandum book. The company manufactures gears and pinions, armatures, fields coils and armatures and you may have your choice of several kinds of comfortable arm-chairs while Mr. Cartwright is telling you about them.

* * *

The Speer Carbon Company, St. Mary's, Pa., is represented by J. S. Speer and G. P. Fryling, who are ready to show samples and explain the merits of self-lubricating generator and motor carbon brushes and other carbon specialties.

* * *

The well-known O. M. Edwards Company, has a large space in the Manufacturers Building for the purpose of displaying its twenty-five designs of window fixtures and nine designs of extension trap-dor fixtures, for raising trap doors by simply pulling a brass rod which operates a kicker. The exhibit also includes tin barrel spring rollers, sash balances and window fixture hardware.

* * *

The Recording Fare Register Company, of New Haven, which has an exhibit in the Manufacturers Building, makes a specialty of recording fare registers of various types. It also manufactures simple register, which can be readily converted at any time by adding the recording device. Messrs M. D. Yates, F. B. Kennedy and Chas. N. Yates are prepared to demonstrate the inner workings of the machine. A full line of register rod and cord fittings, trolley wheels, trolley catchers, punches, conductors' badges and buttons, and a general line of car fittings are also shown.

* * *

The Standard Paint Company, of New York, is devoting its space to a large display of its P. & B. insulating compounds, Flexite metal preservative paints, insulating varnishes and Ruberoid roofing, and Mr. H. W. Benedict is presenting his visitors with a handsome match box.

* * *

What is said to be the largest insulator ever made may be seen at the booth of the W. R. Garton Company, of Chicago, in Building No. 3. This is one of the Lima porcelain insulators made for the Glenns Falls Power Company and although designed for 60,000 volts has stood a test of 185,000 bolts. The exhibit also includes other railway specialies, such as armature and field coils, tape, insulating compounds, insulator pins and brackets. Mr. W. R. Garton and others represent the company. In connection with this exhibit the Wapak Hollow Ware Company is showing its guy anchors and is giving away a booklet illustrating a test of the Wapak anchor used in bending over a 22-inch white elm tree. Mr. Hugh R. Hick is loking after the Wapak interests.

* * *

Among the prominent railway companies that have placed large repeat orders during the year with the Lord Electric company, of New York, for Thomas soldered rail bonds may be mentioned the Interborough Rapid Transit company and Brooklyn Heights Railroad Company, of New York City, United Railways Company of Baltimore, the Railway and Electric Company of Washington, D. C., Boston & Northern and Old Colony of Boston, Montreal Street Railway, Montreal; United Railways Company, Detroit, Indianapolis & Western of Indiana and the Coeur d' Alene and Spokane of Idaho. This season's numerous orders for bonding new track with Thomas bonds includes the Newton & Northwestern, 90 miles, Buffalo Lockport & Rochester, 100 miles, and the Indianapolis & Crawfordsville, 40 miles.

* * *

The Franklin Car Heating Company, represented by Mr. H. D. Hequembourg, is showing five different types of the Western car heater, for use with various sizes of cars. The same company also has an exhibit in Machinery Hall, where a new form of pneumatic trolley retriever is being demonstrated.

* * *

At the booth of the Heywood Brothers & Wakefield Company in Building No. 4 are two forms of the Wheeler car seat, one upholstered in green plush, showing the detachable back feature,(and another upholstered in rattan, showing the grab-handle and brass back-band and the woven rattan car-seat webbing.

* * *

At the booth of the Franklin Electric Manufacturing Company, of Hartford, Conn., may be seen a service test on Franklin street railway lamps. This test is made by means of a virbrating machine on which are placed two ordinary lamps and four street railway lamps so the observer may witness the comparative vibration. This lamp possesses a far greater useful life than the ordinary lamp operated under similar conditions. P. S. Klees, F. E. Wilson, and C. Leonard are representatives in attendance.

* * *

The Baldwin & Roland Switch & Signal company, of New Haven, Conn., has an interesting exhibit at Space 20, Section B, Building 6, where it has a set of automatic block signals operating under actual working conditions. It is here demonstrated that as many as 17 cars may enter the block and all be accurately counted by this signal. Mr. H. Roland, the manager of the company is on hand to explain to visitors that this signal not only works perfectly in this booth, but that it is giving good satisfaction on several large electric railways.

* * *

While the booth of the Philip Carey Manufacturing company, of Cincinnati, is not a large one, it is very tastefully arranged and contains an exhibit of much interest to those in need of fire-proof roofing and all kinds of asbestos materials. To their exhibit will be added on Wednesday a display of asbestos paints in all colors. Space 16, Section B, Building 6 is the location of this booth and J. H. Cooper, John C. Davies, R. B. Crabbs and A. E. Brown are in attendance to explain the merits of their goods.

* * *

At the Creaghead Engineering Company's booth in Building No. 1 can be found many of the standard overhead wire and pole fittings that have aided in keeping this company in the front rank of manufacturers. In addition to the regular stock the exhibits include new malleable iron pins for porcelain insulators on both high and low voltage lines. This company has recently placed on the market an illuminated car sign that is marked out along new and interesting designs. The sign is on exhibition. The booth is arranged with a view to symmetry, all of the exhibits being fastened to panels and distributed uniformly along the walls. The display is in charge of T. J. Creaghead, president and general manager, and Claude Johnson.

* * *

As complete a display of any class of goods that can be found in the exhibition halls is to be seen in the booth, in Building 3, occupied by the Blake Signal & Manufacturing Company. This company has set up a complete system of signals which are designed for safe operation of electric and steam railroads. The Blake signal is intended for use in connection with a telephone system and the purpose of the signal is to allow the dispatcher to selectively signal to any telephone point on the line when he wishes to communicate with passing train crews. The mechanism used in the dispatcher's office is shown in complete working order at the booth. Edmund J. Burke, president of the company, C. C. Blake, vice-president, and general manager and George S. Hastings have charge of the exhibit.

* * *

Just east of the fountain in Building No. 4 is located the exhibit of The Equipment Protection Company, of New York. Here is displaved a full line of Barrett controller regulators. J. M. Gibbons and H. J. Robins are in attendance to explain the detailed working of this economical device. Many of these equipments are now in service on electric railways and giving good satisfaction.

* * *

"Watch the flag! When the flag is out I am in, when the flag is in I am out," is the way a sign reads that is located over the booth of the Security Register & Manufacturing Company. This company has constructed a very substantial arch over the middle of its booth on which appears the corporate name of the firm. Seven of the latest designed registers can be seen at the booth. Two of the exhibits show the simple construction and accurate interior workings of the exhibit. Giles S. Allison and Daniel J. Fitch are superintending the display of goods.

* * *

The Standard Brakeshoe Company, Aurora, Ill., has its booth in Building No. 2 with a display of various patterns of brake shoes. Some of the most recent shoes put out by this well-known company, can be seen in the exhibit. Among these is a two coil insert shoe which is designed to increase the wearing qualities of the shoe without increased wear on the wheel. The company's shoes provided with composition inserts are also attracting much attention. Messrs. C. P. Wright, general manager and F. C. Peck, general salesman of the company, are presiding over the reception that is in constant session at the booth.

* * *

The Kalamazoo Railway Supply Company, of Kalamazoo, Mich., has the exhibits of its well-known railway materials arranged conveniently in the space occupied by it in Building No. 1, Section C. The tower hand car which this company has successfully placed on the market is attracting deserved attention. A 30-foot stretch of track has been laid in the booth to aid in demonstrating the valuable points of the car. Other displays that can be found in the exhibits here is the Root railway scraper and fender, three sizes of different style of automatic track drills which can be adapted for any type of rail, several track jacks and a motor inspection car. The company's booth is in charge of H. G. Haines, F. N. Root, J. W. Thorn and D. A. Moore.

* * *

The St. Louis Car Wheel Company, of St. Louis, Mo., is showing at its booth its new make of interurban wheel, which is especially recommended for high speed cars. This company recently placed on the market a new type of wheel provided with channel spokes which are being shown in the company's exhibit. The company's interests are in charge of John W. Nute, president and general manager, W. W. Talman and F. O. Grayson.

* * *

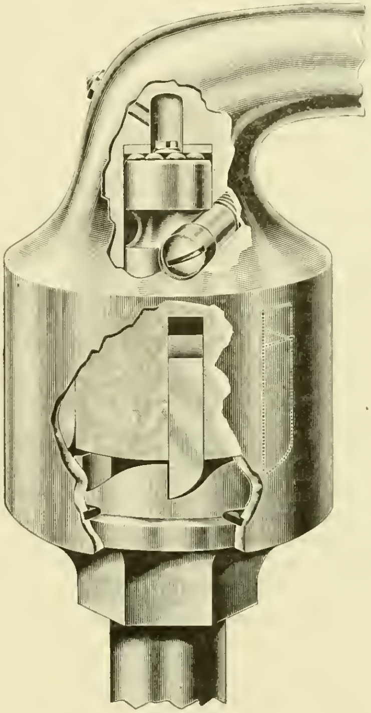
The Ohio Brass Company has in attendance representatives from the various agencies and branch offices at New York, Chicago, Pittsburg, St. Louis and Atlanta in addition to a large delegation from the factory at Mansfield, Ohio. Among the devices exhibited at the space in Building No. 1, is the Lintern signal system which is shown in full operation and will be found to be very interesting to street railway operators.

* * *

Even the plant most fortunately located with reference to a supply of good water must find occasion sooner or later to clean boiler tubes and for such work efficient apparatus is more than half the battle. The Lagonda Manufacturing Company is showing in Building No. 1, Section B, Spaces 20-21, a full line of cleaners of designs suitable for regular and special requirements. The behavior of these cleaners in action is to some extent indicated by 24 different types which are shown in motion. The company is now producing turbine cleaners which are modern in design. The efficient water power cleaner with ball bearings and other up-to-date features are also shown as are a number of the other boiler room and steam specialties.

* * *

When may springs be eliminated? is the question the Adams & Westlake Company claims to have settled in its gravity ratchet brake-handle, which has been exhibited for several successive years at the street railway conventions. The essential features of this handle is the gravity pawl substituted for the old style upper-toothed ratchet. There are six of these independent gravity pawls, while the solid lower ratchet member has eight teeth. This permits two of the pawls to engage on opposite sides of the ratchet, while the others are so spaced that two more are ready to drop into engagement on a slight movement of the handle, the result being 24 separate grips in one revolution. Another novel feature is the anti-friction ball-bearing located in the top of the staff and operating on a hardened steel plate to obviate all wear between the staff and the handle. In addition, the handle is practically noiseless, because of the absence of springs.



Gravity Ratchet Brake Handle.

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One of the things that should not be missed is the demonstration of Thermit welding which is held daily at 4 p. m. in Machinery Hall, where the track exhibits are shown. Welding by the Thermit process has attracted wide attention and the opportunity is here presented to witness the methods employed and judge of their effectiveness. In order that the condition may approximate those met in service welds are made of a 9-inch half-groove rail to a T-rail, the sections employed being the Lorain Steel Company's 94-313 and the Illinois Steel Company's No. 723.

Straight joints of 8-inch T-rail are also welded. By the Thermit process continuous rail may be installed by the track force in any paved street, either on isolated joint or straightway track, without interruption of vehiclar or electric traffic. As is generally known the process is a chemical one and accordingly no outside power is required. The total weight of appliances for one day's work is about 1,200 pounds.

* * *

The spacious booth well supplied with settees and easy rocking chairs at the left hand north end of Building No. 1 is that of the Electric Storage Battery Company of Philadelphia. Here are shown a type of cell recently manufactured for the New York Central & Hudson River Railroad, to be used in eight substations, which have a total aggregate capacity of 60,000 horse power; also another type of cell installed on the New York, Long Island & Pennsylvania railroad (P. R. R.) of 4000-kilowatt capacity A carbon regulator for use in connection with this company's regulating booster system is on exhibit; also sample plates and typical curves obtained from the chloride accumulator on railway systems are shown. A decorative feature of this booth is a collection of photographs showing many of the installations of chloride accumulators in railway power stations and sub-stations.

* * *

It has been said that "good goods are done up in small packages." The booth of the Starr Brass Works of Kalamazoo, Mich., is not a large one, but the many years that its trolley wheels and harps have been giving splendid service on the many electric railways warrants the assertion that their line of wheels and harps exhibited at Space 15, Section B, Building 1, are exceptionally good. Mr. O. P. Johnson, secretary and treasurer of this company, who is in attendance at the convention says he is not showing any new kinds of wheels or harps, because he considers that the present line meets all the requirements. He is pleased to see all who are interested in wheels and harps.

* * *

The Gold Car Heating & Lighting Company, of New York City, was prepared for the worst, but is just as pleased as the rest of us that the worst is yet to come. To make the booth homelikht and comparable, having in view the expected cold weather the company placed improved single and six rod panel, truss and cab electric heaters on exhibition and had them connected up for keeping the hooth heated. On the rear wall of the booth are neatly arranged many of the different types of heaters. Large ruhber plants placed about the room add much to the home-like appearance. The company's representatives are A. E. Robbins and F. A. Purdy.

* * *

The Baldwin Steel Company, of 133 Reade street, New York, has a large and complete exhibit of Hudson high speed steel in Building No. 2, Section D, Space 8, 9 and 10, including drills, taps, reamers, milling cutters, metal slitting saws and other high speed tools. It is displaying a full line of Hudson high speed track and ratchet drills which should be of particular interest to purchasing agents and master mechanics. A curious exhibit is the pile of large chips cut from steel tires by Hudson high-speed steel which are a demonstration of the efficiency of this particular high power steel for this class of work. They will be pleased to show and explain their product to all who care to call.

* * *

The Peter Smith Car Heating Company, of Detroit, is exhibiting one each of every style of heater manufactured by it. The new distributing plate which goes over the heater in such a way as to divide the fire and force it to heat all of the coils uniformly is also being exhibited personally by Mr. Smith, president of the company. The hot water heaters made by this company can be found on four of the large interurban cars now on exhibition at the convention. In addition to the exhibit of the heaters there is exhibited in the booth of the Peter Smith company an assortment of solder rail bonds, made by the Flexible Mesh Rail Bond Company, of Ypsilanti, Mich. This interesting exhibit is in charge of J. P. Clark.

* * *

A. Morrison, H. P. Hubbell, C. J. Ellis, J. L. Adams and J. G. Carruthers, who are the convention representatives of the Rail Joint Company, of New York, have been busy during the past two days describing the exhibits of their company. Among other things that are on exhibition at the company's booth can be found the One Hundred percent joint and insulated joint and the company's standard guard rails for use on curves.

* * *

Owing to the fact that the New York Car & Truck Company but recently moved into its new factory at Kingston, N. Y., the officials found it impossible to prepare an exhibit for this year's convention. F. W. Curtis, general sales manager for the company is here in its interests. The New York Car & Truck Company is successor to the Peckham Truck Company.

* * *

An interesting exhibit of electric railway devices is that of the Frank Ridlon Company, of Boston, in Building No. 3. The principal feature of the exhibit is the Ridlon trolley catchers, of which several types are shown, and which is considered to be a perfect device for keeping the trolley pole under control. Messrs. Henry F. Kellogg and L. C. Norton represent the company. The other specialties shown include the Kilbourn track sanding device, babbiting devices, wire connectors, brass cleats, car and register fittings and the Ridlon incandescent headlight.

* * *

The Bayonet Trolley Harp Company, of Springfield, O., represented by Jacob M. Olinger, R. A. Garbough and C. S. Olingir, is introducing its new detachable trolley pole clamp and arm, which have been devised to furnish a quick means of disposing of a broken pole and replacing it with a good one. The company's representatives are also demonstrating the Bayonet detachable harp, which enables a damaged trolley wheel to be removed and a good one substituted in a few seconds.

* * *

The Wheel Truing Brake Shoe Company, of Detroit, is showing half a dozen various types of its abrasive brake shoe for truing flat wheels or grooved tires, which is used on over 800 roads. This brake shoe is presented to be the solution of the flat wheel problem, for when a wheel gets out of true this shoe is applied to the car and grinds the wheel down while in actual service, without the necessity of sending it to the shops. This company has a very neat souvenir in the form of a pack of gilt edged domino cards.

* * *

The exhibit of the McGuire Cummings Manufacturing Company is not confined to the display of the Romunder single-truck semi-convertible car and the McGuire snow plow. It includes also the type 39-A short wheel-base truck, the No. 10-A truck which conforms to M. C. B. standards and the solid steel Columbian single truck. The M. C. B. design should be of particular interest and the other trucks are notable for the small number of parts, a feature which indicates that they should be more than ordinarily economical from a maintenance standpoint.

* * *

The exhibit of William Wharton, Jr. & Co., Incorporated, in Building No. 2, stands out prominently because of its handsome decoration and the interesting articles exhibited. A manganese steel frog which has given 25 times the service of an ordinary frog in the tracks of the Pennsylvania Railroad attracts much attention and speaks in unmistakable terms for the superior quality of Wharton manganese steel. The various types of special work manufactured by the company are shown. Ingenious switch and tongue throwing devices, tongue locks, spring-actuated tongues, its latest adjustable tongue pivot bearing are shown and operated by the attendants. There are also manganese steel split switches and unbroken main line switches for interurban service. Fine photographs and drawings show noteworthy examples in the wide range of the Wharton manufactures in special truck work. The company is represented by William Wharton, Jr., president; V. Angerer, vice-president; R. C. McCloy, H. F. McDermot, C. Lyman, A. S. Partridge, W. McLain, J. W. Stringfellow, J. B. Robinson, T. Hanley, J. C. Cornelius.

* * *

The Gould Storage Battery Company's display in Building No. 4 is an interesting one. A 49-plate type U battery shown in a lead lined tank has a rated capacity of 720 amperes for eight hours, or 7,200 amperes momentarily for regulating purposes. The 19-plate element of type S in a lead-lined tank is of 180 amperes capacity at the 8-hour rate and has a momentary capacity of 1,800 amperes. A 21-plate type O element in an Appert glass tank has a rated discharge capacity of 100 amperes for eight hours and of 1,000 amperes at the rate suitable for regulating purposes. Two types of elements in glass jars are shown. That known as type N has with nine plates a capacity of 20 amperes for eight hours and of 80 amperes for one hour. The type M element which has nine plates in a glass jar is of a capacity to discharge 10 amperes for eight hours on 40 amperes for one hour. The exhibit of the Gould Storage Battery Company also includes sample boards for stationary work and vehicle work and a sparking set for ignition purposes. Several sets of photographs of installations made by the company indicate its facilities for handling large contracts.

* * *

The Lorain Steel Company has a representative exhibit of its products in Building No. 2. A number of new features in tongue switch construction and T-rail work for interurban railways are being shown this year.

* * *

The International Register Company, Chicago, makes an attractive display of registers and register fittings, conductors' badges and punches, cord, etc. The popularity of these registers is evidenced by the announcement of the company that 2,000 of Type R 7 single registers were recently contracted for by the Brooklyn Heights Railroad Company to be delivered as soon as possible. The company publishes a long list of railway companies having gross receipts of over $1,000,000 who use International registers. Designs, workmanship, durability and interchangeability are relied upon to maintain the company's previous record.

* * *

The Dearborn Drug & Chemical Company, Chicago, was in a fair way yesterday afternoon to get its exhibit in shape for the demonstration of its system of water treatment. The system, which was the result of a long period of painstaking and intelligent study on the part of the late William H. Edgar, founder of the company, has been accepted with well-nigh universal favor among those sufficiently interested in the subject to make a trial of it upon under the conditions of supervision that should govern all tests.

* * *

The Lord Electric Company announces the removal of its manufacturing plant and headquarters from Boston to New York. At the new plant, the company will have improved facilities for handling its rapidly increasing business. The Boston office will be continued as a branch office. It is expected that this change will enable the company to serve its customers better than ever before. The company's address after November 1 will be Fuller Building, New York City.

* * *

The Pressed Steel Car Company has here one of the new cars bought by the Boston Elevated. This is the first all-steel car that the Boston company has secured. The entire inside and outside finish is of steel including the window sash and seat supports. The floor is of cement laid on corrugated steel foundation. The doors, middle and end, are opened and closed by pneumatic mechanism patented by Messrs. Sergeant and Lindall. This device prevents a signal to proceed being given the motorman until all the doors are closed. Mr. W. H. Wilkinson is in attendance and will be pleased to show the details of the construction of the car to those interested.

* * *

Harold P. Brown was late in arriving and did not get to Columbus until yesterday morning—the only excuse he could give was that he was 146,000 behind in filling orders for the Plastic Rail Bond, and minutes were precious.

* * *

The Baldwin Locomotive Works has an exhibit in several sections, but so disposed as to afford more valuable results from the exhibit point of view than if the component parts were all together disconnected from the service they are destined to perform. Two trucks are shown under cars forming a part of the exhibit of the Jewett Car Company in Machinery Hall, four trucks are shown in place under cars exhibited by the Niles Car & Manufacturing Company and one is shown detached in the display of the Standard Steel Works in Building No. 1. These trucks are built of various types for street and interurban railways and for long distance service to suit individual requirements and the long experience of the builders in locomotive work has been of great value in this work.

* * *

Berry Bros., Limited, the well known manufacturer of varnish, has its booth arranged in a pleasing way. On easels are displayed panels of Philippine-woods which are finished with the interior rubbing and polishing varnishes made at its company's factories. On the rear wall of the booth are hung numerous car panels finished with outside finishing varnishes. The exhibit is designed to illustrate the high-class work that can be done with the product made by the company. The representatives having charge of the display are William Stridiron, Thomas Lawler and Ferdinand W. Hormann.

* * *

The booth occupied by the American Steel & Wire Company is among those notable for their pleasing design. Besides the new multi-spindle and single spindle drills which this company has recently perfected, a quantity of copper bonds of all types and wire fencing especially designed for use on electric railways can be seen among the exhibits. The attention of visitors is called to the numerous drills which are shown on steel rails in working order. The multi-spindle drill is designed to drill from two to four holes at once simultaneously. They are double acting and have an automatic feed which may be regulated by the operation. This form of a drill is especially advantageous for preparing the rail for the multi-terminal bonds which have also recently been perfected by this company for railway use. A single-spindle drill built along the designs of the multi-spindle type, is also shown in operation. Either of these drills are easily removed from the rail and as they can be used on any type of rail are very valuable in all kinds of track work. All of the old types of terminal and solder bonds can be seen as well as a large assortment of multi-terminal bonds, provided with from one to four lugs on each terminal. The number of terminals varies according to the cross section of the bond required. As an illustration of the work that can be done at the American Steel & Wire Company's factories, souvenir watch chains made from steel piano wire are being distributed to guests.

* * *

At the display of the Albert & J. M. Anderson Manufacturing Company, Boston, Mass., are represented many of the devices and supplies designed for use on railways as furnished by this well known company. The Anderson time switch, which is one of the most recent additions to a railway equipment, is on exhibition. The driving power of the switch is controlled by a clasp which operates a toggle, thus reducing the gumming and resulting sticking effects. The compartment in which the switch is confined is air tight. The reliability of the time switch has been tested with success under very trying conditions. Another device on exhibition is a new third-rail bracket for use in the construction of an under-contact system. This bracket consists of a malleable iron casting provided with a double insulation clamp and a fibre shield which serve the double purpose of perfect insulation for the rail and a preventive against moisture breaking down at the contact points of the hangers. The displays include all the well known electric railway line materials furnished by this company. The booth is very appropriately trimmed and the displays are artistically arranged. The booth and exhibits are in charge of Ernest Waltmann, William W. Hincher and J. M. Anderson.

* * *

The representatives of the Standard Varnish Works, of New York, have a comfortably arranged exhibit in Building 4, where they are showing sample sections of field and transformer coils impregnated under the Passburg vacuum system with solid insulating compounds.

* * *

The Grip Nut Company of Chicago is represented this year by Messrs. B. F. Stewart, W. S. Wickerman and E. R. Hibbard. The company is showing a large array of grip nuts of all sizes and the men on the ground are prepared to demonstrate that it is impossible for this nut to "back up" on the bolt. They report recent orders for the grip nut in large quantities.

* * *

The exhibit of the Pantasote Leather Company is this year devoted to showing the use of Pantasote as material for car curtains and several styles of curtains are shown with a dozen or more different patterns, all attractive designs. Mr. J. M. High and Mr. D. E. Bonner are on hand to explain the merits of the company's product.

* * *

The St. Louis Car Company expected to have one of its cars on exhibition in Machinery Hall, but was unable to get it to Columbus on time and consequently will have no exhibit.

* * *

The Sterling Varnish Company, which makes all sorts of insulating compounds, has an attractive booth at the north end of the Electric Service Supplies Company's space in Building No. 1. Several barrels of the company's various products are on hand and Messrs. Schenck, Whitfield, Cool, King and Barker will be pleased to explain its merits. They are giving most useful souvenirs in the shape of a hydrometer, as well as samples of the company's insulating cloths and papers, for use with high-tension currents.

* * *

Journal boxes of various sizes for journals of various sizes are shown at the exhibit of the T. H. Symington Company of Baltimore, which is in Building No. 2. Another device which is shown is the ball-bearing center plate designed to minimize friction between the car body and car truck. That it is serving well the purpose for which it is made is indicated by the fact that it is being successfully used on many traction systems. The decrease of friction between the car body and truck results in a decrease in power consumption and in flange wear besides adding much to the easy running qualities of cars on which they are placed.

* * *

The Ideal composition brakeshoe, manufactured by the Spear & Miller Company, of Chicago, has met with remarkable success up to date. Where this shoe is now in service it is said to have brought about a marked reduction in flat wheels, practically minimizing this difficulty on the electric roads. Its coefficient of friction is higher than that of the grey iron shoe and it has a long life in service.

* * *

All the street railway officials who are connected with the departments of maintenance of way and rolling stock will be interested in the latest catalogue of The Dressel Railway Lamp Works, of New York. This has complete information with regard to all forms of switch, signal, head-light and marker lamps.

* * *

The Baldwin Steel Company, manufacturer of high grade crucible tool steel, is showing a complete line of its Hudson high-speed small tools in Building 2, Section D. Among the tools shown are twist drills, oil-tube drills, fluted chucking reamers, taper bridge reamers, rose and fluted shell reamers, plain and side milling cutters and metal slitting saws. The Hudson brand of high-speed steel has produced remarkable records in heavy cuts at high speeds and the chips or turnings shown at the exhibit from turning old locomotive tires at a speed of fifteen feet per minute, are evidences of the exceptional work that Hudson tools will accomplish.

* * *

Every street railway manager will be interested in seeing the new motor axle bearings which are being shown by the Lumen Bearing Company at its exhibit in Building 2. These bearings are cast in metal molds and are so close to size that no machine finish is required, thus saving the cost of the extra weight or casting which has to be turned off and the cost of turning thus reducing the cost of the bearing about 50 per cent. Aside from the economical feature, these bearings are interesting, as showing how perfect a casting can be made in metal molds.

* * *

The American Brake Shoe & Foundry Company, Mahwah, N. J., has what appears like a museum of brakeshoes, but even the large amount of space occupied is not sufficient for the display of all the varieties. Concealed in a stock pile are other patterns than those displayed and it is conceived that some of the company's representatives could produce a few more designs out of their heads if occasion should require.

* * *

The touch of cold weather experienced in the Central and Eastern States last week is suggestive of some of the trouble street railway officials may encounter in the coming months in the way of snow. The electric roads are accepting the practical experience of the steam roads in equiping themselves for these emergencies and are fighting snow with steam road improvements. One of these implements tried out in the exacting conditions is the well-known Russell snow plow made by the Russell Car & Snow Plow Company, of Ridgeway, Pa. These are built for single or double track, trolley, or third rail systems; for right or left-hand running, or to suit the conditions of the purchaser's road. They can be operated at high or low speed, and will clean the track of snow up to 12 feet in depth.

* * *

The exhibit of the Columbia Machine Works & Malleable Iron Company, Brooklyn, N. Y., is not quite completed owing to its goods being delayed in transit. The president of that company, Mr. John G. Buehler, arrived this morning and Mr. W. R. Kirschner came last week.

* * *

The Standard Brake Shoe Company, of Aurora, Ill., is showing its line of steel-backbrake shoes, composition brake shoes, coil-inserted shoes, congdon shoes and plain shoes of special brakeshoe mixture. Representatives: Mr. C. P. Wright, Mr. F. C. Peck and Mr. F. P. Collier. The company has its Chicago office at 315 Railway Exchange building.

* * *

The City of Chicago recently awarded the Western Electric Company the contract for furnishing 1500 series alternating enclosed arc lamps, forty 50-light automatic regulators and seventeen 100-light multi-circuit transformers, the secondary coils of which are designed for two circuits of 50 lights each.

* * *

The Chase-Shawmut Company, Newburyport, Mass., has recently received the following flattering orders:

Cleveland Construction Company, Cleveland, O., for bonds to be used on the Cleveland, Ashland & Mansfield Traction Company's lines. The 300,000-circular mill, type C bond will be used on the ball of the rail.

Olean Street Railway Company for No. 0000. type C-1, and No. 0000, type C-2 bonds to be applied on the ball of the rail, and No. 0000, type BB, 5¼-inch C bonds, to go under the fish plates. This order was placed by the Traction Engineering Company, which is the contractor for the Olean Street Railway Company, Olean, N. Y.

Philadelphia, Coatesville & Lancaster Passenger Railway Company, No. 0000, type A, and No. 0000, type C-1 bonds, to be used on this line, the type A bonds being placed under the upper flange of girder rails, and the type C-1 bonds on the ball of the standard rail.

Helena Light & Railway Company, Helena, Mont. This order was placed by J. G. White & Company of New York, and the bonds were from designs made by that firm. Consistently of two No. 0 cables of sufficient length to extend beyond the fish plates and far enough to have the terminals soldered and bolted through the web of the rail.

ELECTRIC TRAIN SERVICE AND ITS REQUIREMENTS.

Although during the past fifty years the world has profited by more industrial and commercial inventions than in its entire previous history, no other modern improvement has benefited the public at large so much as the electric railway. Having none of the undesirable features of the steam roads, namely noise, cinders, and smoke, the electric system embodies features absolutely unattainable by their old rivals. Among these are rapid acceleration, utilization of central power plants, extreme simplicity of operation, and multiple unit control.

Because of the absence of smoke and noise, electric railways have entered the business and residential sections of all cities, and by virtue of their speed capacity have changed remote country districts into flourishing suburbs. Very low rates of fare on these systems have been made possible by the centralization of power and the cheaper labor which it is possible to employ in operating these cars. In electric train service, one motorman can operate several motor-cars from the front cab; whereas when steam locomotives are coupled together, each must have its engineer and fireman.

Although it has been possible to accomplish these things by aid of electricity, high speeds and quick stops would obviously have been out of the question unless there had been devised a braking system which should be not only safe and flexible, but also simple and fool-proof. The way in which the Westinghouse Traction Brake Company has met these requirements is well illustrated by the elaborate exhibit at the convention. The company shows among numerous other effective braking apparatus the very popular AMM automatic equipment for trains of from one to five cars. This system fulfills requirements which have never before been met, and yet have been the constant desire of all traction men since their cars have been run in trains, a condition which makes an automatic air brake imperative. The AMM equipment embodies not only the safety and reliability of the old standard automatic brake, but also an extreme flexibility in both application and release, graduations of both being made as easily as with straight air. Moreover, this schedule provides for a quick response of all brakes in service and permits of stops being made with any frequency desired, by virtue of its quick recharge feature. One of the most attractive points about the equipment is the fact that although extremely flexible in service yet in cases of emergency a higher cylinder pressure is attainable than with any other braking system ever applied to electric roads. Thus with a 70-pound brake pipe pressure an emergency application gives a brake cylinder pressure of 65 pounds, and this regardless of variations in piston travel. With all these features, there are no more parts required than with the old standard equipment, the operating valves being as simple to handle as three-way cocks. Thus any motorman is capable of controlling these brakes, the "fool-proof" construction of which enables an ordinary mechanic to make repairs with ease.

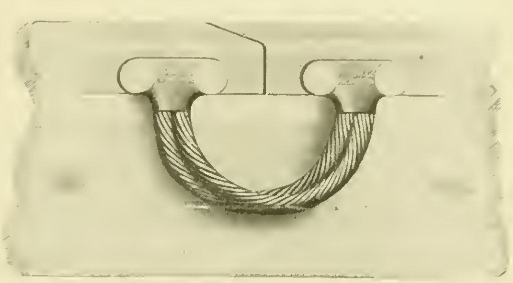
It is by the use of these brakes that 10 trains per day have been made to do the work of a dozen equipped in the old way; for it is obvious that quick and accurate stops play as important a part in the making of fast time, as does rapid acceleration.

With the advent of this brake, new fields have already been opened up to the electric railway. Many roads formerly operated by steam have replaced it by electricity, the advantages of which may now be given full play with no fear of exceeding the capacity of the brakes. With suitable road beds speeds up to 80 miles per hour are now, not only reached, but safely maintained, and the end is not yet.

THE TWIN TERMINAL RAIL BOND.

A rail bond has many severe conditions to meet and overcome. It must be very flexible to withstand the vibrations of the joint, it must be short so as to reduce the resistance to a mimimum and to keep down its weight, and most important of all, its terminals must be so constructed that they can be efficiently applied to the rails by unskilled workmen.

The American Steel & Wire Company has recently developed a new type of terminal steel bond which more nearly approaches an ideal bond than any other on the market. It is an exposed bond, and it is attached to the head of the rail where it is always open to inspection. It can be installed without disturbing the joint and with this company special multiple-spindle-drills, at very low cost. The bond is very short and compact and is so constructed that it has great flexibility. The terminal has two or more small copper studs, each of which has a contact area of one square inch, the number of studs depending upon the capacity of the band. These studs are expanded and securely anchored in small bottomed holes drilled in the head of the rail in such a manner as to entirely seal the contacts thereby ensuing permanently good results. This company will soon issue a new rail bond catalogue which fully describes the diqerent bonds of this type together with their other standard types and also a full line high grade bonding tools which they have recently developed.



Twin-Terminal Rail Bond

THE WESTINGHOUSE COMPANIES.

The Westinghouse exhibits at the convention occupy one whole side of the Agricultural Building in the Fair Grounds, in Section C, Spaces 4 to 19.

The exhibit is lighted by Nernst lamps, Cooper Hewitt lamps and Westinghouse arc lamps, as each of these types has its peculiar advantages. The Nernst lamp gives an illumination which is the nearest approach to daylight that has been obtained, and is particularly effective in the illumination of terminals and underground stations. The Cooper Hewitt light is without a rival for machine shop use or drafting rooms where a light is desired which has the least effect on the eyes. The strain on the eyes from working under its light is no more tiring than in daylight. The Westinghouse arc lamps are of course so well known as to need no mention, and their use is universal for both indoor and outdoor service.

A most comprehensive line of apparatus is on exhibit, including almost every type of device used in the electric railway field. The exhibit of the Westinghouse Electric & Manufacturing Company includes a full line of railway motors, among the more prominent of which are Nos. 92-A, 101-B, 93-A, 113 and 132-A. An interesting part of the exhibit is the Westinghouse unit group system of multiple control in operation. This system, which has been developed by the Electric company, is an ingenious combination of electro-magnetic and pneumatic devices which produce a reliable and effective method of controlling from a single point a single car or a train of cars, all or part of which are equipped with motors. The arrangement is such that each motor car operates as an independent self-propelling unit, which may be connected to other similar units, or to trailer cars not provided with motors, in any combination whatsoever, but which is at all times under perfect command. This unit group system can be used for both alternating and direct current motors and for either double or quadruple equipments. It can be arranged with either automatic or non-automatic acceleration and for operation either with or without train bus line.

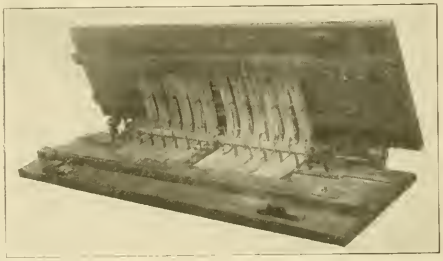
The active element of the main control system is made up of the following apparatus: A group of unit switches which regulate the supply of current to the motors; a set of resistances, or an auto-transformer, which is used in connection with the unit switch group to control the supply to the motor; a line switch which controls the main supply of current to the unit switch group, and a reverse switch which covers the brake and car movement.

The auxiliary control derives its energy from a storage battery which forms part of each car equipment and actuates the main control through the intervention of compressed air drawn from the brake supply. It comprises the following apparatus: The master controller, the train line, the line relay switch, the series limit switch, and the control cut-out switch.

Perhaps the most important part of the system is the switch group. This consists of a number of powerful circuit breakers mounted in a common frame and assembled with their air cylinders in such a manner that when a valve magnet is energized the air will be admitted to the cylinder, forcing the piston forward and closing the switch.

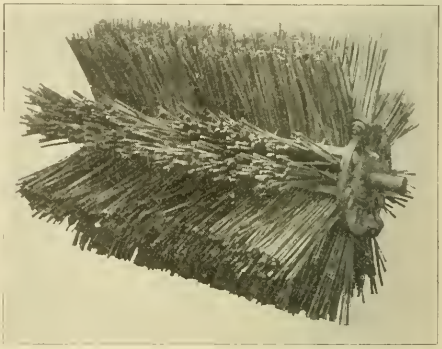
IMPROVED ROTARY SNOW SWEEPING BRUSH.

An improved rotary snow sweeping brush or broom made up of detachable brush section rigidly clamped together to form the complete brush, but capable of being dissembled and conveniently and rapidly filled with reeds by means of a table invented for that purpose, is being sold by the Columbia Machine & Malleable Iron Works, of Brooklyn, N. Y., for use on street railways and elsewhere. The brush and table for refilling it are made under patents held by Mr. Louis J. Remmele, of Newark, N. J.



Snow Sweeping Brush—Broom-Filler in Process of Closing.

Each brush section is composed of four parallel rods lying horizontally and arranged to hold bundles of reeds bent in the shape of a hairpin, so as to offer both ends to the sweeping surface. The reeds in each section are divided horizontally into groups by means of transverse plates through which the rods pass. Ten of these brush sections are held together cylindrically and kept rigidly in place by end plates or heads, through which the main rod of each section passes for bolting. Each head is composed of two semi-circular halves hinged on one side and bolted together on the opposite side when closed. Two of these heads comprise a general section of the broom, which is made up of four general sections. Through the center of these heads pass a main shaft properly secured and locked within a square block between which and the inner circle of the cylindrically arranged brush section boards are slipped when the broom is open to prevent the reeds by any possibility from slipping back from their work.



Snow Sweeping Brush—Sectional Broom Assembled.

By use of the patented table, a simple and easily operated device, the sections are filled mechanically with reeds, whereas formerly it was the practice to insert the reeds by hand, a tedious operation requiring a day's time for one man to fill a broom. It is claimed that the new method not only saves time and labor, but secures greater uniformity in the brushing surface.

The enlargement of the steam rolling mill of the Rail Joint Company, at Troy, N. Y., known as The Albany Iron & Steel Works, has been completed. The rolling mill building is 400 feet long, independent of the machine shops and other buildings. An electric conveying crane, over 600 feet long, carries steel billets from the yard, constantly feeding the furnaces so as to supply two 21-inch trains that are in operation day and night rolling rail joints for tee and girder rail sections, for steam and electric railways. A switch track of the New York Central now runs around the property, bringing raw material, coal and steel billets into the yard, and taking out the finished products. Over 25,000 miles of track are equipped with the company's base-supported rail joints, and the extent of their use is the best evidence of their excellence. The Troy mill is equipped to roll over 125 different sections of rail joints, and there are more than 350 men employed in its operation. Special attention is being given to the production and perfection of the girder and insulating rail joints of various base-supported types.

While the Rail Joint Company owns the works at Troy, N. Y., there are nine other distributing points where its patented machinery and devices are used to produce rail joints under contract with other mills for the convenience of customers, and deliveries are made from Buffalo and New York, N. Y., Newark, N. J., New Castle, Del., Steelton and Pittsburg, Pa., also Chicago and Joliet, Ill., and Milwaukee, Wis. The company also maintains fourteen branch selling agencies. The general offices are at 29 West Thirty-fourth street New York.

Electric Railway Review
· DAILY EDITION ·

PUBLISHED BY THE WILSON COMPANY
at Columbus, O., in honor of the Annual Conventions of the American Street and Interurban Railway
Association and of its allied associations of Accountants, Engineers, Claim Agents and Manufacturers

COLUMBUS: 83 North Third Street CHICAGO: 1660 Monadnock Block NEW YORK: 150 Nassau Street PITTSBURG: 510 Frick Building
Subscription Price, $1; Foreign, $3; Single Numbers, 10 cents. Application made for entry at Columbus, O., as Second-class matter

VOL. XVI COLUMBUS, O., OCTOBER 18, 1906 No. 10d

Traffic Managers' Association.

The question of the formation of a traffic managers' association in connection with the other allied associations is one which is probably destined to become the focus of a great deal of attention in the near future. The first note on this subject was sounded on Wednesday afternoon at the meeting of the American association and was embodied in the report of the committee on "Promotion of Traffic," which included in its resolutions a recommendation that an American Street and Interurban Railway Association of Traffic Managers be organized on the same basis as the other affiliated associations. It is to be regretted that the report of this committee did not elicit a fuller discussion, as the traffic department has been somewhat neglected during the present convention and an expression of the views of different members in regard to the formation of an additional association to represent this branch of electric railway work would have been interesting. It would seem that the traffic department is of sufficient importance to merit more of a representation at such a convention as the present one than it now obtains, especially at a time when railway managements are devoting more and more attention to amusement parks, special excursions and other various means of developing traffic. A traffic managers' association for the purpose of exchanging ideas as to the best methods of inducing a heavier traffic and consequently increased revenues should prove to be productive of results of the greatest value to the electric railways.

The Development of Electric Traction.

Secretary of State Laylin and President Sheldon of the Columbus Railway & Light Company, in their addresses of welcome to the associations yesterday morning so tersely epitomized the history of electric railways in the state of Ohio and by influence in other states that fragments of their remarks are worth bringing together. President Sheldon stated that during the last year the road with which he is connected operated with horses; between six and seven millions of people were carried and the gross receipts of the company were something less than $400,000. Fourteen years ago, at the time when the change to electric operation was made, the road served fifteen millions of people and had gross receipts of nearly $700,000. During the last year fifty millions of people were carried and this year Mr. Sheldon's estimate was that the road would carry 55,000,000, with gross receipts of approximately $1,600,000. This is the story of a single road. The secretary of state, whose official position brings him into touch with the inception of enterprises of this character, in referring to the fact that Ohio has been one of the foremost in developing along these lines, said that during the year 1906, something over 100 companies had made reports to him, showing an authorized capitalization of over $170,000,000, with a subscribed capital of over $150,000,000, with over 3100 miles of track and gross receipts aggregating something over 23,000,000. The story of Mr. Sheldon's road is the history of one enterprise and shows the rate of advancement. The figures given by Mr. Laylin cover the total of such enterprises in the state, it being a fair assumption from this that the rate of growth of the other companies has been equal to or greater than that of the Columbus Railway & Light Company. This is true for other sections of the country, as well as the State of Ohio, although Ohio has unquestionably been one of the foremost in the development of interurban railway enterprises. The record is a remarkable one.

The Position of the Larger Companies.

In his annual address President Ely touched upon the fact that the work of the association was quite as important to the large companies as to the smaller ones; while the larger company has the financial resources wherewith to secure for its organization the best brains that money can buy, and can establish a well-nigh perfect machine for the transaction of its business, yet by reason of its size and of its location in the large centers of population, and also because of the large amount of capital invested, it is more vulnerable than our smaller associations. That a company is so fortunate as to have a franchise for 99 or 999 years is no excuse for its refraining from joining in any movement for the general good of street railways, because no matter how the letter of the law may be, no matter what privileges are extended by virtue of charters and franchise ordinances, the public reserves, in fact cannot divest itself of, the right of taxation, and unreasonable taxation can cut the heart out of any business. What is needed at this time is the education of the public, as to the facts. The public must have the truth, and the truth must be couched in such language as to invite the confidence of the pulic. As Mr. Ely said, for many years the association representing the interests of street and electric railways has feared to discuss some of the live problems, while corporation baiters of every description had been most perniciously active. Had a corresponding activity been displayed in the defense of corporate interests the ideas obtaining today on such questions as municipal ownership and the relations of the public to corporations in general would scarcely have been possible. A step has been taken in the right direction and it is to be hoped that the officers of the association for the succeeding year will continue the policy which was suggested in outline in Mr. Ely's annual address.

Work of the Claim Agents.

The address of President Rhoades before the meeting of the American association yesterday morning was especially forceful. He called attention to the expenses which electric railways were incurring because of those occurrences which are handled through the claim department, and made the point that the expenditure of $10,000,000 per annum is sufficient excuse for the existence of an association of claim agents. A second most important point brought out by Mr. Rhoades was the irreparable injury which may be done by the ill-advised appealing law suits. A judgment in the lower courts may be excessive, but it is far cheaper to settle it than to carry the case up when there is the slightest probability that an adverse decision might be rendered by the supreme court and a precedent thus set. In connection with the work of this association so strikingly brought out at the morning session of the American association, it is proper to add a brief review of what has been accomplished at this, the second convention of the Claim Agents, which has been a most pronounced success. Claim agents representing more than 65 different electric railway companies were in attendance and the first Question Box proved a most successful and interesting one. The questions and answers aggregated more than 100 printed pages and one entire day was devoted to its discussion. The questions and discussions related to railway companies of various character and sizes. While one year ago it seemed doubtful whether or not the Claim Agents' association would be able to weather the storm, it has under the reorganization of the American Street and Interurban Railway Association and with the co-operation and with assistance of the officers of that association, presented to the members at this year's convention a programme which was better and more complete in every respect than heretofore. Two printed reports of the proceedings of the convention will be forwarded to each member of the American Street and Interurban Railway Association. Two additional committees were appointed; one to devise ways and means for securing proper legislation regarding the beginning of actions for damages for personal injuries, and the other, an employment committee. It is the object of the employment committee to receive and place on files the names of competent claim agents who for various reasons may desire to change their positions or who may be seeking employment for various reasons, such as the consolidation of railway companies, changes in management, etc.

Form of Committee Reports.

We have noted with great interest, the report to the American association of the committee on "Promotion of Traffic," of which W. E. Harrington, of J. G. White & Company, is chairman, and H. E. Reynolds, Boston, and H. F. Grant of Seattle, are the members. The report is striking in certain novel features which differ quite materially from other reports heretofore presented to the association. The scheme of the report in brief covers a digest of the accumulated statistics as obtained by the committee, its findings thereon and the series of resolutions for the association to act upon. The presentation of resolutions for the association to consider and thus enabling it to place itself upon record is the strong feature of the report and immediately commands attention in the reasonableness and necessity of so doing, as it crystalizes the report and makes it obligatory upon the part of the association to place itself upon record in definite and concise terms. The association's work has been criticised strongly in the past in that the association has not been sufficiently strong in its assertions and expressions of opinion to assist and guide the operators of the various companies making up its membership. If the association requires that its various committees' reports be summarized and concluded with strong positively expressed resolutions, it will result in making the association the strong factor that has always been the desire of those particularly interested in its welfare. We have heard frequent comments upon the passive character of the association and feel that the practice and precedent as established in the report of the committee on "Promotion of Traffic" will set a new pace in the work of the association and will result in its members feeling that the organization is all that it has been intended to be and will redound to the credit of the association and the very material benefit of its members. Were the plan outlined in the report of this committee to be followed as regards all the other business of the association it would result in vastly increasing the influence which the association would exert. Instead of a mere expression of individual opinion on which action may or may not be taken, the reports submitted to the association would be acted upon favorably or otherwise or amended and then acted upon and the result would be seen in two directions. First, the recommendation of the association would mean something; it would have its influence in affecting the action of those interested financially or otherwise in electric railways, but not having practical experience in the management thereof. Secondly, there would be brought home to the delegates who attend these conventions and do the work of the association, the responsibility which rests upon them.

QUESTION BOXES

For several years the Question Box has been a feature of the programme of one or more of the electric railway associations and at this convention all of the affiliated associations have Question Boxes, one of them comprising, with the questions and answers, approximately 50,000 words. The purpose of the Question Box is to secure information on a considerable number of subjects which in the aggregate may be very important, but which taken singly are seldom broad enough to warrant the preparation of a treatise, such as papers or reports presented to the association are presumed to be. An important field can be covered by the Question Box, but aside from the information comprised in the answers when presented at a meeting of the association, the value of the work done is further increased because the answers as well as the questions are often such as to draw out debate at the meetings of the associations to which they are submitted. We believe, however, that the utility of the Question Box could be vastly increased were a plan different from the usual one been followed in presenting the information secured. Language means at least two things—what the writer intends, and what the reader understands—and as the number of readers increases the number of interpretations that can be put upon a question can often be correspondingly multiplied. The questions which form the basis of this class of papers are some times carelessly drafted and invite answers that are more or less sarcastic and which, while making interesting reading, scarcely can be said to add much to the sum of human knowledge. In numerous instances questions are answered with a mere yes or no, and with any considerable number of conflicting replies and irrelevant side issues raised it is rather a burden for the reader to deduce from the answers given the recommended practice which the question was designed to bring out. The reports for the three older associations for the year 1905 comprise a book of over a thousand pages, containing in the neighborhood of half a million words, and it would seem desirable to avoid adding unnecessary bulk to these proceedings. It is submitted that were the replies in the Question Box carefully digested and summarized the result would be a far briefer statement, giving the information secured shorn of irrelevant matter and put into a form that would be more easily grasped by the reader. At the same time, there would be no material loss because a statement of acceptable practice deduced from answers sent to the editor of the Question Box would form a better basis for discussion than the more or less disconnected replies which are now in some cases submitted. The Question Boxes presented at the convention this year contain much information that is both interesting and useful. In that of the Engineering association there has apparently been followed the plan outlined here of digesting and abstracting the data comprised in the answers submitted, and in most instances there appears in answer to a question only one paragraph containing the gist of the replies. In case diametrically opposing opinions are expressed by those answering, a separate paragraph has been assigned to each opinion. We believe, however, that greater weight could have been given to the summaries as published had there been stated the number of companies replying to the question. In presenting the Question Boxes of the other associations the Electric Railway Review will follow the plan outlined and present the salient points briefly summarized.

CONVENTIONALITIES

The annual meeting of the American Street and Interurban Manufacturers' Association will be held at 4:30 p. m. Thursday, the 18th, in Grange Hall, which is located upstairs at the east end of Building No. 2.

Mr. Henry L. Beach is attending the convention as a representative of the Chicago Union Traction Company.

Mr. W. C. Graham, general manager of the Standard Motor Truck Company, of Pittsburg, arrived here Wednesday to aid in looking after his firm's interests.

Mr. James H. McGraw, president of the McGraw Publishing Company, has been somewhat indisposed for the last day or two and the annual meeting of the Manufacturers' association was postponed on that account. We are, however, informed that he is so far recovered as to assure his presence at the Fair Ground during the remaining days of the conventions.

Mr. Lawrence Manning, general manager of the Owosso & Corunna Electric Company, of Owosso, Mich., arrived from the north Wednesday and will remain until Friday.

Mr. Burton R. Stare, formerly superintendent of the Peckham Manufacturing Company, has accepted a position with the Wallace Supply Company, of Chicago and New York, and is attending the conventions.

One of the Wednesday arrivals was Mr. W. G. Ross, managing director of the Montreal Street Railway Company Montreal, Can. He is stopping at the Southern. Mr. Ross is particularly interested in the manner in which the "Pay-as-you-enter" cars in the Brill exhibit are received by railway men on this side of the international boundary.

Mr. J. W. McBane, a member of the board of directors of the Stratton estate, which has a prevailing interest in the stock of the Colorado Springs & Interurban Railway Company, Colorado Springs, Colo., came to Columbus Tuesday night after making a short visit in Cleveland. Mr. McBane is a native of Ohio.

Mr. J. A. Hanna, representing the Niles Car Manufacturing Company, is presenting his friends with a souvenir that gives them a pointer as to how the "game" is played.

"Hello, Sunny Jim" was the exclamation frequently heard about town as delegates caught sight of the smiling countenance of Mr. Jas. H. Denton, formerly superintendent of the National Brake & Electric Company, and now manager of the new air brake department of the Allis-Chalmers Company. Mr. Denton has been in evidence early and late, particularly late, maintaining this reputation—apparently without effort.

A party of five representatives of the Fort Wayne & Springfield Traction Company, Decatur, Ind., arrived at the convention halls this morning. The party consisted of Mr. W. H. Fledderjohann, general manager; Mr. T. W. Shelton, superintendent; Mr. Charles Dirkson, Mr. Henry Dirkson and Mr. Henry Aumann.

The new badges of the Manufacturers' association have arrived and may be obtained in exchange for the temporary badge at the association headquarters in Building 1.

Mr. T. L. Oppenheimer, superintendent of the Ohio River Electric Railway & Power Company, and of the Pomeroy & Middleport Electric Company of Pomeroy, Ohio, is in attendance at the convention.

The Scioto Valley Traction Company has extended the courtesies of its lines to the members of the Railway association for the convention week. Transportation will be furnished to any point on the lines on application at the ticket office in the station at Rich and Third streets, between 7:30 a. m. and 5:30 p. m. Trains on the Chillicothe division leave every hour on the half hour and on the Lancaster division every hour on the even hour.

The informal reunion and dinner of the Accountants' association at the Southern Hotel last evening was a most enjoyable function. The number of those present was 43, of whom six were ladies and two were guests representing the technical journals which are honorary members of the association. Following the dinner, President Brockway, as toastmaster, presided in a most happy manner; there were no set speeches but several heart to heart talks.

Mr. Walter Chur, of the American Railway Supply Company of New York, manufacturers of metal badges and checks of all kinds, continues to hand out a valuable souvenir. It is a grip tag, and is both handsome and useful.

Mr. Oren Root, Jr., vice president and general manager of the New York City Railway Company, came to Columbus Tuesday. He attended the meeting of the American Street & Interurban Railway Association yesterday.

Mr. Strathearn Hendrie, general manager of the Grand Rapids, Holland & Chicago Railway Company, was one of the first delegates to register and receive a badge on Wednesday morning. Mr. Hendrie arrived Tuesday night.

Dr. D. J. Rice, president of the Colorado Springs & Interurban Railway Company, of Colorado Springs, Colo., is attending the convention. In company with Dr. Rice are Mr. B. M. Lathrop, superintendent, and Mr. Carl S. Chamberlin, treasurer of the company.

Owing to unforeseen contingencies the Dressell Railway Lamp Works of New York-Chicago, was unable to follow out its plans for a separate booth in which to display a line of railway lamps. However, Mr. J. M. Brown, the western representative, is present at the convention and has made his headquarters with the Electric Service Supplies Company booth, where he is showing a few lamps especially adapted to electric railway service. He will be glad to see his many friends at this very handsome booth and have them enjoy the music and carefully observe Rule 5.

Mr. Bassell's quotation from Byron in addressing the convention yesterday morning fell partly upon the ears of at least one of his audience who was heard to murmur gently:

It's nice to hear the dachshund in the dark
  Whine softly when we're late in coming home;
It's nice to know the dachshund will not bark
  And call attention to the time we come.

Whether you prefer a watchdog that barks or the kind of an animal that is half a dog high and a dog and a half long and only whines, depends entirely upon circumstances.

REPORT OF THE COMMITTEE ON CAR WIRING.

M. G. STARRETT, CHAIRMAN; E. W. OLDS, C. B. KING, JOHN LINDALL.

The committee appointed by you to confer with a committee from the Underwriters' National Electric Association for the consideration of Rule 32, National Electric Code Car Wiring and Equipment of Cars, begs to report as follows:

Your committee has not found it necessary to meet during the year, such questions as have been brought up for consideration having been satisfactorily handled by correspondence. No changes have been made in Rule 32 National Electric Code Car Wiring and Equipment of Cars, and such changes as have been proposed by the Electrical Committee have been reported adversely by the joint committee of the Underwriters' Association and of your association. The joint committee recommended one change in the rule as follows:

Rule 32, Paragraph g, Sec. 2:

"b.—Heaters to be constructed with a protecting ventilated metal casing, providing an air space of not less than 2 inches on all sides of the resistance. Heaters to be so located that the resistance will be not less than 4 inches below the under side of the seats, or from any woodwork, unless the under side of the seat, or such woodwork, is protected by not less than ¼-inch fire-resisting, insulating material, or .04 sheet metal with 1-inch air space between the sheet metal and the seats or woodwork."

This recommendation of the joint committee, however, was not adopted by the Electrical Committee of the Underwriters' National Electric Association, and the rule remains unchanged.

CONVENTION PROGRAMME.

Thursday, October 18.

American Association.

10 00 A. M. to 12 30 P. M. (Interurban Meeting)

Report of Committee on Heavy Electric Traction.

Paper—"Elevated Railways and their Bearing on Heavy Electric Traction," by H. M. Brinckerhoff, Consulting Engineer, New York.

Paper—"Electric Railways in Sparsely Settled Communities," by E. P. Roberts, of The Roberts & Abbott Company, Cleveland, O.

Paper—"Interurban Limited Trains," by Harrie P. Clegg, Dayton, O.

Paper—"Interurban Freight and Express," by E. C. Spring, General Manager, Dayton, Covington & Piqua Traction Company, West Milton, O.

Paper—"Tickets and Rates," by F. W. Coen, Secretary and Treasurer, Lake Shore Electric Railway Company, Cleveland, O.

Paper—"Some Notes on the Evolution of Electric Transportation," by Theodore Stebbins, Expert, National Civic Federation, Cohasset, Mass.

Appointment of Nominating Committee.

2 00 P. M. to 4 30 P. M. (Employes Meeting)

Report of Committee on Rules.

Paper—"Electric Railway Employes and the Young Men's Christian Association," by E. M. Willis, Railroad Secretary, International Committee of Y. M. C. A., New York.

Paper—"Selection of Trainmen," by C. E. Learned, Superintendent of Inspection, Boston Elevated Railway Company, Boston, Mass.

Paper—"Discipline of Trainmen," by F. W. Brooks, Assistant General Manager, Detroit United Railway, Detroit, Mich.

Paper—"Uniforms and Badges," by John R. McGivney, Purchasing Agent, New Orleans Railway & Light Company, New Orleans, La.

Accountants' Association.

10 00 A. M. to 12 30 P. M., 2 00 P. M. to 5 00 P. M.
(Executive Session)

Review—"Depreciation as Applicable to Electric Railways," by Robert N. Wallis, Treasurer, Fitchburg & Leominster Street Railway, Fitchburg, Mass.

To be followed by Discussion.

Installation of Officers.

The National Civic Federation announces that it is expected its special committee, appointed and sent to Europe to study the matter of public ownership and operation of public utilities, will be ready to render a full report in December.

A cable dispatch from London of September 29, says: "Oxford as the home of lost causes has clung tenaciously to horse tramways. The city council, after setting its face sternly against municipalization, has accepted the tender of a private construction company for the electrification and the lease of the tramways, overhead wires being excluded. There was a choice between the surface contract system and side slot conduits, and the Dolter method has been preferred, with the reservation that it will not be introduced until it has been satisfactorily tested at Rotherham or elsewhere for a period of six months. The council may not have made a good bargain, but the promise of electric tramways is a sign that the world moves, even at Oxford."

AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION.

President Hon. W. Caryl Ely, of Buffalo, N. Y., called the first session of the American Street and Interurban Railway Association to order on Wednesday morning, October 17, at 10:45 o'clock, and said:

We may reform and we may reorganize, but in one particular we will always remain the same. It may be enforced upon us at every meeting that ten o'clock is the hour for convening, but we are always late. We have not the attendance here present that we should have to evidence our respect and our appreciation of the courtesy that is shown us by the coming here to address us of several gentlemen of distinction. We have met here under pleasant skies and the most beautiful possible set of conditions, but warmer than the rays of the sun, and clearer than the blue of the sky has been the welcome of the men and women of Columbus to all of us here in this convention. We have in many places within the recollection of those who have been attending conventions for many years received warm welcomes; we have received the keys of different cities, but it is seldom, if ever that so much has been represented as in the courtesy and hospitality that we have received in Columbus where each one seems to vie with the other in doing all that is possible for us to insure our comfort, our convenience and our pleasure. Without wearying you at this time with any further remarks, it affords me great pleasure to introduce to you, the Hon. Lewis C. Laylin, who will extend to you a welcome to the State of Ohio.

Mr. Laylin: The welcome to which your president has referred is not confined to the city of Columbus; it is as broad as the area of the State of Ohio. I regret that business of urgent necessity has deprived you of the pleasure of the attendance of Governor Harris, the chief executive of our state. I know that it would have been his pleasure as well as a great privilege to have appeared before you and on behalf of the people of this commonwealth bidden you the welcome which it has fallen upon me to extend to you.

The pioneers who came to Ohio from your eastern states in the early days did not live long enough to see the wonderful progress that has transpired since the early 70's in this state. They could not in their fondest dreams and in their wildest imagination have anticipated what a hundred years of progress has done in this commonwealth or in any other of the sister commonwealths of our great union. But it is not quite so with you gentlemen who have to do with these great interests for the furtherance of which you have assembled together. Almost every one of you can remember the very beginnings of this great work, this great department of human activity, of human skill. and I suppose you do not stop, as you gather here to consider the wonderful achievements that have been made right along these lines of human endeavor. You have come to a state that was one of the very first to take forward steps in the development of the interurban and other railway systems of the country.

It is the duty of the secretary of state to aid officially in the promotion as well as afterward in the organization, of these great enterprises that have to do with the construction and maintenance of these wonderful organizations. This state is, perhaps, among the very foremost in development along these lines. Something over a hundred companies have made reports for the year 1906, where the authorized capitalization was over $171,000,000, with a subscribed capital of over $151,000,000, with a mileage of over 3100 miles and gross receipts aggregating something over $23,000,000. So that when you come to Ohio you are in the midst of the movements along these lines, which are, as I have said, the marvel of the century. You have lived long enough to help to overcome some of the earlier prejudices against the extension of lines from the busy centers of populations out among the rural inhabitants of the state; you have lived to the time when you are welcomed along any highway as you bring to the people advantages that they little dreamed of at the inception of this great work, but which are now fully appreciated and fully desired so that rights of way are easily obtained and advantages brought to the humble home of the farmer or artisan, the common people of this and other' states, are so great that they recognize you as engaged in one of the most useful of occupations and enterprises toward building up the commonwealth and the making of happy and contented homes. So it is a matter of congratulation, as well as in the spirit of welcome, that I come before you to congratulate you upon what I have seen in the very short time that I have been permitted to remain upon the grounds. It would take for me an interpreter to understand what I saw. The wonders are far beyond my reach. You who are experts will go from booth to booth and will see what the cunning hand of man has designed and what the wisdom of the brain work of the country has produced and may think little of it. But when you explain it to the people who are not familiar with the technical knowledge which you possess, it seems all like a strange dream, and we can only rejoice with you in your capacity as contributors to the public good.

Let me assure you, figuratively speaking, and in your own terms, that you can have the right of way in Ohio for your convention, for yourselves as individuals and for your friends, along the streets and highways not only, but to the homes, the pleasure grounds, the society grounds upon which you are, the streets and highways and to the hearts of the people of Ohio. You will not have to go before any body and ask for consents, written or verbal. All the people of Ohio, I know, will second me when I say, you are most welcome here in this commonwealth. May you from this great educational exhibit, for I deem it such, take away knowledge which will help you onward in your noble work. This is an educational exhibit. It is wonderful how much may be acquired by those who are dealing with these problems, on an occasion of this kind, and so I say that it has not been in vain, in my judgment, that something like twenty-five years ago, Mr. President, you and others formed the initial organization, away back when the problem, as I am told, was how you should take care of your horses that drew the street cars along the main streets of the principal cities of the country. You do not deal with that problem any longer The horse gave way to other motive power, and other motive power gave way to that wonderful agency that you and I do not understand and never can understand, the electric current. When that came, then followed the wonders to which I have alluded.

I have said that I believed you are now welcomed in your enterprises along the streets and the highways of the counties as well as the cities. What would we do in Columbus, what would you do in any city now without the aid of the enterprises which you promote and foster? What would the country do now, after a little experience with electricity, if it were deprived of the interurban lines, in this city eight of them, radiating into the country, bringing to the farmers and those who may reside in the suburbs or far out upon the farms all of the advantages of which the city used to have a monopoly? You have been engaged in this kind of work and so the commonwealth of Ohio, realizing what you are doing for the body politic, for the people as a whole, is glad to have you here, glad to get the inspiration which you bring. I can only say in conclusion, after having had this very great privilege and honor of appearing here for a moment, that we wish your stay may be in every way delightful to you, not alone personally and socially, but that you may be able to take away something that will help you to give better service and bring you nearer in appreciation to the hearts of the people with whom you must deal and to whom you must look for generous support.

President Ely: Mr. Secretary, you have warmed our hearts by your pleasant words of greeting and welcome, and, after having had extended to us in this beautiful way the right of way in Ohio, we will not need the right of eminent domain nor power of condemnation, but only the present privilege of commendation.

President Ely: The Columbus Railway and Light Company has vied with all the other citizens in extending courtesies to us, not the least of which is the address of welcome on behalf of that company, which will now be made by Mr. Robert Sheldon, president of the company, and whom I take great pleasure in introducing to you.

Mr. Robert Sheldon: A little more than two weeks ago I received a letter from President Ely asking me to deliver an address of welcome to this organization and suggesting that it be brief. Whether our worthy president was ignorant of my oratorical powers or jealous of them, fearing that I might by my eloquence become a formidable candidate for his place, I do not know, but, being of the rank and file, and conscious of the duty of a soldier, I will comply with his request, although I had cherished a mild ambition to make a long speech had it not been for his admonition to be brief.

Secretary of State Laylin has referred to horses, and that gives me just a thought. Looking over some papers last night I found that the last year we operated with horses we carried between six and seven millions of people, with gross receipts of something less than $400,000. Fourteen years ago, at the time of electrification, and not stopping to mention the intervening years to 1898, we reached fifteen millions of people with a gross of nearly $700,000. Last year we carried fifty millions of people and this year will carry fifty-five millions with gross receipts of approximately $1,600,000.

While on my feet I want to express to you gentlemen my gratitude for the very complimentary way in which you have referred to our plant. So many have come to me and said pleasant things that I feel grateful, for I do not believe there ever was a body of men so able, bright and competent to say what is good in electrical operation as those who compose the convention held this year.

Remembering the injunction to be brief, and knowing that I am to be followed by our worthy mayor, who always speaks entertainingly, and by Mr. Bassell, who is so often heard on behalf of Columbus, there is nothing for me to say further than that I extend to you a cordial welcome to our city.

President Ely: We are particularly favored this morning in the number and extent of the remarks of greeting and welcome, but that is merely typical of the warmth and heartiness of our greeting here at Coloumbus and the general outpouring of good things on our behalf. On behalf of the city of Columbus we are to be welcomed by Hon. Dewitt C. Badger, mayor of the city, whom I now have the pleasure of introducing to you.

Mayor Badger: You are here for business and I will not intrude on that business by making a long speech. I am glad to see the bright faces in the hall today. Your president has alluded to some being a little late and a lack in the early session of quantity. I am sure, however, from the general make-up of the delegates and guests present that if there be anything lacking in quantity it is more than made up in quality. You are here, gentlemen, I believe, "with the goods." Columbus is ready to welcome you, her gates are open, she has no gates and there is no need of any keys. The city is yours, and in the hands of such representatives as Messrs. Hutchins, Sheldon, Pirrung, Bassell and various others that you will meet, if you do not have a good time while you are in the city it will be your own fault, and I do not believe that you are going to be faulty in that respect. I hope you will not while you are in Columbus. Her citizenship, composed of people from various counties in the state and from the various states in the Union and the various countries of the continent, are all ready to welcome you. We have a citizenship here that has not all grown up in Columbus. While a good portion of it has grown up in the city, yet a large portion of it comes from other parts of the country and from other parts of the world, and together they comprise a citizenship that tries to keep up with the progress of the times, step to step, and shoulder to shoulder with the advancement that is going on; and we are glad that we live in this age. I have heard others say they would like to live back in the golden age or some other equally happy age that the historians and literateurs tell us of, but we would rather live in this age. This is an electrical age. The age of electricity, of power and progress, an age that we like to live in. We like to have you come here and touch shoulders and be with us. We like to be with you and to learn from you. It broadens us, and we hope that you in turn will not be dulled any by having rubbed up against us as you have come to Columbus.

Now, this age we speak of as the electric age, is one of power and progress, and we are glad to see you here with us. We expect to profit in many ways by your visit to us, and we hope that your visit will be profitable to you as well. We have in this city many manufactures we would like you to see. Our friend Hutchins here manufactures many of those things that you apply electricity to, and our street railways, both city and interurban, are ready to carry you miles and miles around this country here to show you what electricity has done for us. It has wrought wonders right here in the capital city of Ohio, and through central Ohio. Talk of Aladdin and his lamp, and all that, electricity beats it all to pieces. That we have such a prosperous section here in central Ohio, we owe largely to the enterprise of the men who have been engaged along those lines; those pioneers and forerunners of the prosperity we are now enjoying. God bless you; we hope you will continue along these lines, and that your prosperity and progress will still be with us. You are welcome to the city, and we hope your stay well be pleasant and that you will have kind memories of your stay with us.

President Ely: On behalf of the Association I thank you for your graceful welcome. The mayor's assurance that the gates are down and that if we do not enjoy ourselves it will be our fault, I know will be hailed with joy by many that are here. We have been accustomed in our gatherings to vault the gates when gates were interposed in our way and to pry up the lid when the lid was down. If gates are down and the lid is off, much misdirected energy may be saved.

Last February the executive committee of this association composed as you know, of the president and the vice-presidents of the American association, and the presidents of each of the affiliated associations, came to Columbus to investigate the place with reference to its adaptibility for the purpose of holding this convention. We came here with a desire to pitch our tent upon you, but owing to the fact that in all cities of the size of Columbus the hotel accommodations are usually deemed inadequate for the proper entertainment and convenience of so large a number of people as come to these different gatherings, we were very much afraid that if the convention were located here possibly we might not be able to carry on the different branches of the convention work as they should be. On these occasions when selecting the convention place, we are somewhat along the line of knockers. It is difficult to satisfy us, very difficult to make us see that adequate accommodations may be provided. We met a committee of gentlemen silver-tongued, handling the truth with a recklessness which we feared might provoke danger to personal liberty but at the same time using such logical and convincing argument that at the end of our visit we went back to the East and assured every one that we felt certain that the convention would be beautifully entertained at Columbus and that things would be done in such a splendid way as to meet the approbation of all. In bringing about that condition of mind on our part none was more powerful, none more efficacious, than the secretary of the Columbus Board of Trade—a jewel in a business and oratorical way that graces the diadem of Columbus' business success, a gentleman that you will be delighted to hear. I take pleasure in introducing Mr. John Y. Bassell the secretary of the Columbus Board of Trade.

Mr. Bassell: Byron has said:

It's sweet to know a loving eye will mark,
Our coming and grow brighter as we come.
It's sweet to hear the watch dog's honest bark,
Bay deep-mouthed welcome as we draw near home;

If that be true, gentlemen, how sweet it should be to you to know that a cityful of people stands today with outstretched arms extending greetings, with hearts attuned to hospitality and to good fellowship. It seems to me that it should be most sweet and satisfying to you. This week our people have given up to you and to fair content. If you have brought with you one care, one trouble, we beg you to dismiss it and be merry and happy in the good fellowship and proffers of hospitality that will be extended to you. Are you welcome? I would say that there are two hundred thousand welcomes pulsating this moment to this body. Every man, woman and child in this Ohio capital city is filled and surcharged with welcome for you. Now, as to the cogency of the urging that was extended to your committee, have we not made gloriously good? (President Ely: You have.) We promised nothing of which we have not in my honest judgment made fair delivery, and as to the weather God has presented to you the most magnificent specimen of his great weather handiwork. Do you want to come again? If you do, all the good things that have been yours will be augmented and we have assurances that the weather will be at the old stand. You are welcome, very welcome. I know we must part with you, but a few short days and you will have gone. We hope that when you go it may be a parting with you of sweet sorrow, with us a fond farewell.

President Ely: While great in promise, Columbus is greater still in fulfillment, even to the weather. I want to say to you that when we came up here last February there had been a heavy snow storm. We had to walk up from the corner down by the railroad track where the street terminal is, and we viewed these cold buildings with some degree of apprehension, but Mr. Bassell stood up in the middle of one of the buildings and said: "Why, when you come here in October the foliage will still be on the trees and the winds of heaven will rustle through them gentle zephyrs and breezes to fan your fevered brows, and out of the clear sky a beautiful sun will blaze down, and these buildings and all these places will present a scene of beauty, and be a thing of beauty and joy forever." That is his discription almost verbatim of the place, and the weather has actually filled the bill. We have with us in attendance upon this convention. Mr. Citaro Sakuma, of Japan, who has been sent by the government of Japan to study the express business in this country, and his credentials from the consul general of Japan, at New York, say that any courtesies extended to him will be appreciated. He also represents the Tokyo Street Railway Company, and is commissioned by them to inquire into and report on matters concerning the operation of street cars in this country, and your courtesy is bespoken for him by the consul of Japan in Chicago.

The next order of business will be the report of the executive committee and of the secretary and treasurer. In introducing to you at this time, for the first time in a convention of the reorganized association, its secretary, Prof. Bernard V. Swenson, I desire to say to you that we have secured as secretary of this organization a man in every way up to and in touch with the ideals that we believe now actuate this re-organization.

The secretary then read the minutes of the various meetings of the executive committee during the year, outlining the arrangements which had been made for the management of the affairs of the association and the plans for the Columbus convention. On motion, the report of the executive committee was accepted and filed.

Secretary Swenson presented the report of the secretary, which showed the membership to be as follows:

October 1, 1906: Associate members		113
Active members, old	145	
Active members, new	55	200
Joined since October 1	23	
Old companies paid dues since October 1	5	228

The report of the treasurer showed the following financial transactions during the year:

Cash on hand and balance from last year and receipts during 1905-1906	$25,444 11
Expenses	18,467 21
Balance	6,976 90

On motion, the reports of the secretary-treasurer were approved and filed.

The secretary read a certificate of the auditing of his accounts as treasurer, signed by P. S. Young, comptroller of the Public Service Corporation of New Jersey.

President Ely then delivered his annual address.

PRESIDENT ELY'S ANNUAL ADDRESS.

I am standing here before you to address you in the capacity of president for the last time. Three years ago at Saratoga you all remember the condition into which the affairs of the association had drifted by some chance and it transpired that I was flung into the breach. There were many men who had given careful thought to the affairs of the association, and its condition at that time was apparent to all. We were in fact a social organization, with some business which we transacted in a certain desultory fashion. The organization had done a lot of good work, but its work was failing because of certain conditions inherent in a situation that had grown up.

The association was in the first place an organization dedicated to a business that was small, and was founded when a few individuals were largely the owners of a street railway. But there had come to the business a tremendous accretion caused by the electrification of street railways in the cities and the construction of great arteries of interurban traffic, so that where before a few millions had been represented in the business, billions of dollars had actually come to be represented, and instead of men for the most part of a moderate degree of ability there had come into the profession thousands of men of the finest ability possible for money to obtain.

The association was in such a condition that it was of no particular benefit to any one. All who had been members of it loved it, many men connected with the business from the old days were devotedly attached to it; it had been the medium of communication between them and had brought about close ties, socially as well as in a business way. I do not speak of the old organization in terms of contempt, and as this is the last time I am to talk to you I know you will not misunderstand me, because I have a message to you, and I believe, I have earned the right to talk to you freely and pointedly.

The difficulties that attended the situation were very great. It is impossible to describe them; they are known to you. When we look back to a period three years ago we find that we were an organization without a home. No one seemed to be able to bear the expense of taking care of the entertainment of such a great organization. The meetings had been held in New York and Detroit and the street railways of these cities had acted as entertainers in the old-fashioned way, but the expense had become such a great burden that the local companies were not willing to assume it. For a few years we went like the wind, which bloweth where it listeth. We went where we pleased and we commenced the work of reorganization. I am sorry to say that some men thought that it was impracticable to carry out the plans we laid, but it is given to some to possess the powers of imagination that others are devoid of, but without which the world would be today where it stood centuries ago. The men who embarked upon unknown seas, the men who have blazed trails through the wilderness of the forests and the business woods, have always been subjected to the criticism of those who knew not where the way tended, and whose powers of imagination and divination had not enabled them to see unless everything is plain and open. "Knock and it shall be opened unto you," and those who have knocked upon the closed doors, in all the course of history, are the ones to whom it has been opened, and men owe their thanks today to the men who have pounded, perhaps sometimes in vain, but succeeded by others have pounded until that which blocked the way has yielded and then the way has become plain.

Now, for one, I wish to say as a serious-minded man who sometimes wreathes his remarks in smiles, and as a serious and reflective man, that I saw a great responsibility resting upon the men who assumed, and upon whom it was put, to lead in the reformation of the organizations; I saw lots of difficulties, misunderstandings, lots of responsibilities of different kinds to be assumed, but you have put me there and when I assume responsibilities in all my life I have never been recreant knowingly to a trust that was imposed upon me. I have looked upon this business as if I were to receive a large salary in money for the transaction of it, and I thank all of you who have worked with me in this matter. It is to the credit of the business that there has been such unanimity of favorable expression and of helpful work and of common effort. In attempting to get an organization the question arose, what kind of an organization would we better have? and so we employed to make an investigation into all of the great organizations and technical societies that are doing this kind of work in the world today, Professor, Norris, an eminent man and engineer of Cornell university, who studied carefully more than twenty-eight different organizations and who presented to the committee on reorganization the results of his work in a report that is really monumental Finally, last year, it was settled what the line of work should be and what we should do, and it was settled that there should be a central office whereat there should be maintained a secretary who should have a salary and who should be selected by the executive committee with an idea to peculiar adaptability for the performance of the work that would be before us Then the executive committee started out to lay down the line of work and to inaugurate it in every way. It was attended with a great deal of difficulty but it finally came to pass that quarters were secured at 60 Wall street and the services of Professor Swenson were secured as secretary of the organization and the work actually commenced.

Now, is it worth $600 for the largest companies in the United States to belong to this association and is it worth to the other companies as you come along down the scales graduating them by their gross earnings the various sums that they respectively pay towards this organization? I think that is a fair question and every man is entitled to be "from Missouri" and to be shown. It is impossible for the executive committee or the officers of the association to show to any one a chain of six hundred dollars in nickles actually going into the treasury of the company—that is an impossibility; or the amount of money that any one pays in. But to the work of the past year I invite your careful attention. It is impossible for me to more than outline it to you, but in the printed bulletins which have been sent to you from time to time in the reports, circulars, and letters of the various committees and the data sheets, which have been distributed by them asking for information in order that they might view the actual facts, and in the programme of this convention and the work that is going as you have seen it in the Manufacturers' association and its splendid exhibit that has been put up here so far away from the homes of the manufacturer—in this the largest attendance that I have ever seen at the opening session of our convention, and in the committee rooms, wherein our affiliated organizations since Monday morning have been carefully and systematically carrying on lines of work that are parallel, though well defined, to the line of this organization and all dove tailing together and working comprehensively together—in all these evidences it seems to me is proof of the value of the work accomplished through the money that has been expended in bringing about the reorganization. A great corporation that takes in ten, fifteen or twenty million dollars can afford to hire the best technical men and bring to its aid the best ability in every line of this worm of ours. That is to say, those companies are justified in an attempt to get the best, but when you think you hire the best it takes time to prove whether you have done it or not. Suppose it were possible to conceive of an organization wherein all the men were the best, or almost the best in their respective lines of work, then you would have the very best organization that it would be possible for a single corporation to bring to its assistance. But then it would be limited to a very few men compared to all the thousands that throughout this land and throughout this continent—because our representatives come from all over it—that are carrying on the different branches of business. Then in addition to that point, which possibly I should clarify, my idea is that organization, even in that part where men are hired to do certain lines of work, is helpful in many ways, because all the thousands get together in these conventions. Through this line of work as it is now proposed to carry it on, all standing shoulder to shoulder, each one helps the other. In the technical branch of the business a corporation is best able to fortify itself by paying handsome salaries and getting good men, but there are other things in which the large corporations are more vulnerable than the small corporations. The corporations of the great cities are reached far more quickly by the accidents of time and the changes in conditions than are companies in the smaller cities and interurban districts, and when you come to the final analysis the security of the rights under which these corporations transact their businesses finally rests upon an honest and fair sentiment actuating the minds of the whole people. No. line of work can be carried on to greater advantage by this great organization than in proper ways, well revised and well calculated, to educate the people of the country to a just and thoughtful conception of the rights of corporations, not only for themselves, but as they touch the people, and also of the business conditions under which they operate. I fancy that there is not a man today who is well read and well informed in this business who doubts for a moment the right of the people of any community to take over in a fair way and operate the public utilities, any of them, through their municipalities or other territorial domain. As a matter of right it is undoubted. Then it is upto you to say to the people that as a business proposition it is unwise for the municipalities to attempt to do a business which you are able to establish to the satisfaction of everybody can be done more cheaply for the people by private business interests than by municipal corporations. For years we were afraid to discuss the question. For years we said "Don't bring it out and talk about it in the convention,' 'and during all those years, all the other fellows were talking about it, all the newspapers were spreading what was largely misinformation before the people, and a sentiment was forming against us, that, had the people who entertained it had the just and fair means of information, might have been very different from the manifestations that have become apparent within the last few years all over the country.

When we made up the committees we went about and asked suggestions from the best men in the business, men who were thoughtful and farseeing and our attempt was to get able men, strong men, to do actual work upon actual working committees of the organization. I cite you with pleasure and with feelings of great pride to the lists of the committees of this organization and its affiliated organizations. I say to you, that in my best judgment as one who has had experience upon the legal side of this proposition, as a practicing lawyer for twenty years, one who has had experience for nearly fifteen years as a builder and operator of railways and who has studies these questions in the sociological and every other point of view, that within the next five years it will be cheerfully acceded by the managers of the greatest corporations of this country that the work of the committees on municipal ownership and public relations of this organization if they are conducted in the way that I believe they will be, will have been worth all this organization has cost to all the street railway interests. When it is possible for this organization to bring to the chairmanship of the municipal ownership committee such a man as Mr. C. D. Wyman of Boston, a man with legal training, who knows how to collect evidence and the value of evidence and what it means when presented and how to glean the facts from it about the law and to disseminate it—when you get such a man as that who adds to all his legal learning and ability a personal knowledge of all the conditions that affect us, who represents companies and organizations in almost all the states of the country, thereby putting him in touch with the feeling that obtains throughout the country in these matters—when it is possible to bring the ability and the time of such a man as that to your service, who shall say what it will be possible to do when you work this thing along until it reaches a stage when men like that all over the country will be anxious to come to your service? Who shall say what this organization will represent? I do not single out one man at the risk of having others feel that they, who are equally worthy and meritorious are neglected, but I know I may rely upon every man who is working upon these various committees to know that his work is appreciated by you all. I have not time to refer to all. I simply ask you to examine carefully, reflectively and thoughtfully the lists of committees and remember that they are actively at work, and then I ask you to say to yourselves, managers and executive officers of great corporations, "Is it possible for me to obtain anywhere for the paltry sum of six hundred dollars the benefits that move to me from the service on behalf of my corporation of that magnificent body of men?"

It has been very difficult to get the work inaugurated. All the gentlemen whose names appear upon the committee lists were communicated with, the nature of the work was made apparent to them and they were asked by us if they would serve upon those committees. Many of them debated very carefully whether they were in a position to give the time that the work demanded. So that the committees represent a work of careful selection, putting to the members the proposition whether they could do the work and their acceptance means that they are harnessed in this work by their own consent. So far everybody is pulling well on the evener and there is no kicking in the traces perceptible.

As has been known for years and so often said the proof of the pudding is in the eating. A year ago we had a certain number of member companies, and this idea of reorganization was comparatively new. I wondered, and so did many of the officers, how many we should have at the end of the year It gives me great pleasure to say to you in summarizing briefly the report of the secretary and treasurer that whereas last year we actually had paid up at the time of the convention and in good standing, less than one hundred and eighty-seven members—I mean actually paid up and in actual good standing—we have this year two hundred and twenty-eight member companies and one hundred and forty associate members.

On Monday morning it was my pleasure to address the Engineering association, Monday afternoon the Claim Agents' association, Tuesday morning the Accountants' association, this morning your organization. This afternoon I have been kindly asked to talk to the Manufacturers' association, and then I believe there is still something left for me to do. I have not sought to trammel myself in my talk to you by the limits of a written document, and I trust that you will understand why I did not desire to do that, and that you will feel it was through no desire on my part to escape the labor of committing thoughts to manuscript; but in the atmosphere of the places and of your presence I hoped to be able to say things out of my mind that would convey to you the principles that have actuated me and the ideas and feelings that prompt me thus to talk to you.

It is very very important that we bear in mind what I believe to be the present situation. In talking to the engineers I said that while much had been accomplished, success in my judgment was not yet assured. Mr. James H. McGraw was present at that meeting and he said to me this morning on his bed at the hotel, where he has been quite ill for a couple of days, and thus unavoidably absent this morning—he said, "I do not think that you were right in saying that success was not assured." I have been in politics since I was 18 years old. When I was 18 years old I commenced to make stump speeches. I want to say to you that nothing has ever burnt my fingers so badly in politics as a sure thing. I have never been hurt in business so badly as by sure things. They are deadly. They dull the brain. They paralyze energy, they stop effort. I say success is not assured. We have made some few first steps, and those who come after the present officers have a world of responsibility upon them to see not only that the present rate of progress is kept up, but that it is constantly accelerated. That acceleration, like the power of the motors of the big cars that we have to move quickly must be very rapid, because if we do not produce concrete results, within the next year or two of far greater magnitude, than we in our feeble way have been able to produce, there will still be doubts. But if you move the thing forward in the way in which it can be moved and the way in which I believe the successors of these officers will move it, within two years you will wonder just as much at the conditions that have prevailed, and why they were permitted to prevail so long, as those who live fifty years after us will wonder how it were possible to have horses in the streets when horseless vehicles could be obtained.

I wish to speak of the work of the secretary's office. When a business man, especially a street railroad man, thinks of a college professor keeping books and doing actual practical work, he is quite inclined to doubt whether the professorial ability is just equal to coping with problems like ours. I wish to say, without any desire to flatter Professor Swenson, that he has brought to the management of the secretary's office a peculiar mixture of necessary qualities for that work. I invite you all to go to his office. I wish to impress upon you that it is your duty when in New York to go to the headquarters of the association just to look at things. You are paying money there, why not take a look in to see what the secretary is doing, converse with him, encourage him by your presence, and perhaps greatly aid him in some way that you may not know of. The work of the secretary's office has been very great. Out of those three small rooms have been turned in the way of actual literature, typewritten, dictated letters, over 6,000; received, over 4,000; printed and mimeographed circulars and communications, over 20,000; printed data sheets over 18,000, and, bulletins, over 17,000. The books and records have been kept in the most perfect manner, as is certified to by Mr. Young, and for the first time, almost, you have an absolute roundup showing our exact situation with regard to the companies of this country. Now, that of itself is a great accomplishment, because there is a lot of work to be done to bring in all of the companies that should be in. That is word-of-mouth work, it is hand-clasp work, it is work of personal inquiry and of personal request. I have never seen, except in political headquarters where forces have to be quickly got together and a tremendous amount of stuff turned out in a very short time just before elections, so much of that literature and work turned out of a small place like that as out of the office of the secretary of this organization.

I wish to say that the affiliated associations have risen to the occasion and the emergency in the most splendid way. Some of the organizations at first did not understand just what the situation was and how the thing was to be worked out. It was felt by some that somebody's heavy hand might be laid upon them and that they might be made to do things that they did not want to do, that the forms of organization were to be interfered with and all that sort of thing. That has all vanished. When we got together and talked it over that was all threshed out. They all came together. It was resolved that the constitution and by-laws of the different organizations should be, in so far as was possible, just like the parent organization.

Now those associations and organizations rose to the occasion and have been very helpful in every way and have done their business in a way that has been very satisfactory.

The work of the present convention is sufficiently outlined in the programmes that are before you, and the work of the coming year is also outlined. In the printed proceedings of the convention, you will find statements concerning the state of the art and what has been accomplished this year.

I have about finished my messages to you. I wish to say that I feel perfectly satisfied, and hope you all do that this convention pitched its tent in Columbus. We shall go away from here with the most beautiful recollection of hospitality, of this handsome city and the people that grace it with their citizenship.

Mr. John I. Beggs: I desire to ask the indulgence of the president at this point to present a matter of personal pleasure and privilege. All that your president has said this morning has impressed itself upon his associates, the other officers and the executive committees of our co-ordinate associations in such manner and with such force that we felt at this time, when the results of the inexorable flight of time bring us to a point where Mr. Ely retires from the principal executive office of this great association and its co-ordinate associations, that we might place of record on the archives of this association, and express to Mr. Ely in a manner that would be enduring, some slight acknowledgment of our appreciation of the value which we place upon his untiring, patient ability on behalf of this association and the great interests that we are here to represent. I think possibly no one has come quite so close to Mr. Ely in many of these affairs as I have myself. At. St. Louis, two years ago, I made a personal appeal to President Ely to yield his preferences at that time and continue as your president, because we were just then about undertaking the great work of remodeling the fundamental laws under which we should continue our work. At Philadelphia, twelve months ago, when many of my friends in their indulgence thought that I should be made the principal executive officer of this association I said, "No; the work is only in the formative stage as yet," and I again made an appeal to President Ely to continue in office for another twelve months. There are those of us who are charged with a great responsibilities of administering these affairs who are not here for the temporary honors, notwithstanding we highly appreciate them, but we are here to try to perform a great service to this great industry which is growing greater every day. Therefore, on behalf of the officers and executive committees of the five associations which are affiliated in this work, I am charged with the pleasure and with the duty of presenting to you something that is emblematical of the triumph which we believe has been achieved for the time being.

At this point four of the train service men of the Columbus Railway & Light Company entered the hall bearing a marble column, capital, and bronze statute which were carried to the president's platform and assembled. The statute is a magnificent bronze by Bofill, entitled "En Triomph," which was chosen as being especially appropriate to symbolize the triumphs which have been achieved by President Ely in carrying to so successful a conclusion the plans for the reorganization of the American Street Railway Association and its allied organizations. The bronzei s inscribed: "A token of appreciation upon the retirement of Honorable W. Caryl Ely from the presidency of the American Street and Interurban Railway Association, American Street and Interurban Railway Accountants' Association, American Street and Interurban Railway Engineering Association, American Street and Interurban Railway Claim Agents' Association, October 17, 1906."

I may say that this is a rare work of the sculptors art typifying triumph, and I desire, on behalf of this association, Mr. President, to say that I believe that you will carry with you and I know we will carry with us, memories as enduring as the bronze from which that figure typifying triumph has been modeled and molded. I may say that we have had placed upon the base of that figure a tablet setting forth that this is a testimonial from the American Street and Interurban Railway Association and from each one of the affiliated associations, that for all time shall show what was the inspiration which produced this combination of these associations. (Applause).

President Ely: I will only say that this beautiful gift brought up and placed here by street railway men in uniform, I shall prize perhaps more highly than any material possessions with which I may ever be blessed. I appreciate and esteem more highly than any words of mine could possibly frame an expressed of, this beautiful gift, this evidence of your appreciation and your esteem; and I trust that as we go along together down the corridors of time that we will be drawn closer and closer together, and that we will never any of us, have reason to regret the labors of the last few years, and perhaps when a little more time has gone by and the results of our work become more and more clearly apparent that we may renew to each other the felicitations of this day. I thank you all most sincerely. I assure you that I owe you a large amount of gratitude for the beautiful manner in which you have responded to my efforts and the way you have manifested appreciation of what I was attempting to do and the soul touch and the heart touch that has been established between us, I trust may ever grow stronger and stronger to the end.

I have the pleasure of introducing to you the presidents of the affiliated associations. They will address you briefly upon the work of their associations and their relations with the parent association. I take pleasure in introducing to you as the first speaker the president of the Accountants' association, whose effort and endeavor has been constantly with us in the past year, Mr. W. B. Brockway.

Mr. Brockway: I do not see how I can possibly condense into anything short of one hour and a half what I wish to say regarding our association and our work. However, I do wish to say that the Accountants' association has worked in the past few years in cordial and thorough harmony with the reorganization plan. We are at this convention celebrating our tenth anniversary.

During the ten years in which the Accountants' association has been organized much has been accomplished for the benefit of the street railway business in respect to accounting matters. Some of us have worked hard, but I believe all of our men would echo heartily what I say now that we would gladly repeat the efforts of these ten years, simply to be able to call, as we do call, the Hon. W. Caryl Ely, our friend. You do not have the slightest idea of the amount of work that this man has put into this cause. I believe it is true martyrdom for this man to give up three years of his efforts in order that there might be built up an association which will typify this statue of triumph.

President Ely: It is owing to the united work that characterized all these committees and affiliated organizations that the present standing of the associations has been arrived at. President Adams, of the Engineering association will now speak.

Mr. Adams: The Engineering Association sends to you all a greeting and best wishes for a most successful convention. We have just passed through two days of successful meetings. Our papers have been presented in a very able manner and the discussion has been very full and complete. We will hold another session of our convention this afternoon. We feel that we have put forth our efforts in a very successful manner. For the future we have laid out work for the standing committees so as to carry on the work continuously. Our idea is that it is necessary to have the work laid out in that manner to accomplish anything of value. The support which we have received this year from the treasury of the parent association has taken care of the requirements for the last year. Having in mind, however, the work of these standing committees we anticipate that our needs for the future are going to be somewhat greater. We do not wish the past year to be taken as a criterion. Our association wishes to urge upon the various companies, and I have no doubt that this request will be echoed by the other associations, that when requests for information are sent out to the various roads that the date sheets or whatever form they go out in they be put in the hands of the proper party or heads of department ,and that the officials of the roads will see that the heads of these departments give the necessary answer that should be given. It is only by such co-operation that we can accomplish the work before us. I feel sure that we can count on that co-operation and getting it we will give the results that are expected of us.

President Ely: We will now have the pleasure of listening to President Rhoades. (Presented elsewhere.)

President Ely: There has been no greater question before the Street Railway Association for some years past than the position that the manufacturers and their exhibits should occupy. After a great deal of agitation, the Manufacturers' association, was formed and the holding of the exhibit was divorced entirely from the treasurer's department of the main association. Last year Manufacturers' association installed a splendid exhibit at

Philadelphia, at its own expense, and this year there is a far greater exhibit. I am told by some of the ablest men, who are here representing the manufacturers that this is the largest exhibit and best exhibit of these appliances that has ever been made in this country, and is better and larger than the one that was made at Washington when the International Railway Congress met there in May of last year. There has been an idea in the minds of some of the railway men that the men of some of the companies came to these conventions and were subjected to influences by the supply men that produced injurious results. I wish to say that it is my judgment and I ask you to reflect upon it, that when we shall have gone away from this place we will all acknowledge that there has been a new line of demarcation laid down. In the first place, I should say that this exhibit was worth to any man who comes here all that it cost him to come, and that it is worth to a company that sent a number of men here all that the entire cost of this organization is to them. More can be seen here by any man who comes here to study these things, at a trifling cost and traveling expenses, than could be seen in six months in visiting the different places where these appliances are made. We are all agreed that the exhibit is educational and beneficial to all of us, and shall we deprive the men who are employed by the companies the great benefits of such an exhibition because of the indiscretion of a few individuals? Not so, things do not go that way in this world. My advice to the manager who has a man he is afraid to send here because he will yield to improper influences is to let him go.

The president of the Manufacturers' association is well known to every man in the street railway business throughout the world. I do not suppose there is a man who has gone to him and asked for information and assistance but what has received something that was helpful to him. He is a man whose knowledge of the business is world wide and who is devoted to the interests of the street railway business, that is Mr. James H. McGraw. Unfortunately, in laboring about this exhibit last week in the storm he contracted a very bad cold and cannot be here at this time, but so well is that organization officered that we have here a man to represent him, who is almost equally well known, Mr. Charles C. Peirce, of Boston, who is here to represent the Manufacturers' association.

Mr. Peirce: It is with a great deal of timidity that I rise to speak for our association. Our president, Mr. McGraw, has simply worked himself out. You little know the detail of the work we have attempted to do for you, but we are doing it willingly and we are going to try next year to do it better and that is my word to you today. This is the third meeting we have participated in and the second appliance exhibition we have handled. The work is before you; you can judge it for yourself. It has been honestly done; the funds are audited and honestly kept. The first year at St. Louis the executive committee was obliged to make up a slight deficiency, but Mr. Brady, who was president at that time—you cannot appreciate the initial work that man has done for you—said, "Never mind; we must take care of this thing and it must go on." Last year at Philadelphia we were a little behind and the committee assessed the manufacturers. We have come here and made this exhibit and we hope we have proved our worth to you, and we will retire this year with a solid bank acount to take care of you next year. I believe this work will go on, and I know I voice the sentiments of the officers and members of the Manufacturers' association in making this statement. I look forward to the time when the steam railroad interests will come to your meetings as fully as the street railroad interests. I told that to the members of the Master Car Builders' and Master Mechanics' associations. I made that statement some years ago, and they are commencing to believe it. Whether they become electric or you become steam, a fraternizing of the two interests is going to be the ultimate end of this thing and we will have the grandest organization that the industrial world has ever seen.

President Ely: Every one is immeasurably indebted to a number of these gentlemen for the work they have done, and the spirit manifested in the remarks of Mr. Peirce is proceeding along new lines. No man can come here and see anything done by the Manufacturers' association, or its members, but what will tend to elevate this business.

The meeting then adjourned until 2:30 o'clock.

Wednesday Afternoon Session.

President Ely said that there was some business to be transacted, which was largely of a formal nature.

Secretary Swenson then announced that a cordial invitation had been received from Mr. Frank A. Davis, president of the Scioto Valley Traction Company inviting all of the members of the four allied associations to take special trips on the system of the Scioto Valley Traction Company, from or to any points they may desire, and that upon presentation of badges at the office of the company, at the corner of Third and Rich streets, Columbus, Ohio, tickets would be furnished as requested.

Also, that an invitation had been received from Mr. Wm. M. Thompson, president of the Ohio State University to visit the buildings of the University and to inspect the equipment of the various departments and the work being done in them .

Also, from the Central Union Telephone Company and the American Telephone and Telegraph Company, extending to the delegates attending the convention the courtesy of the use of their lines after 6 p. m. daily during the sessions of the convention from pay station located at the Chittenden Hotel, Neil House, Southern Hotel, Hartman Hotel, No. 8 North High street, Union Station and Fair Grounds.

Also a certified copy of a resolution adopted by the city council of Columbus, Ohio, at its session on Monday, October 15, which is as follows:

"Whereas, our community was highly honored when the officers and delegates to the last annual convention of the American Street and Interurban Railway Association selected this city as the place for holding the 1906 convention of said Association, and

"Whereas, said convention is now being held in our city with a very large attendance of officers and delegates, including an attractive and fine display of up-to-date electrical devices and equipment by representatives of some of the largest business firms in the country;

"Now therefore, be it resolved, by the council of the city of Columbus and state of Ohio, that we recognize as the guests of the city each officer, delegate and representative of the American Street and Interurban Association, as well as each representative of such business firms and we join the citizens of the entire city in extending to all a hearty welcome and express the sincere desire of contributing in any way possible to make their stay in our city pleasant and profitable.

"Resolved, further, that a copy of these resolutions be sent to the officers of the American Street and Interurban Railway Association. Signed, D. C. Badger, Mayor; George W. Rightmire, President City Council; John T. Barr, City Clerk."

Also a letter of invitation from the Columbus, Delaware & Marion Electric Railway Company extending to the members of the association free transportation over the lines of its road during convention week, the association badge being accepted as evidence of membership; also a letter from Mr. George Westinghouse of Pittsburgh, regretting his inability to be present at this meeting; also from the American Society of Mechanical Engineers sending greeting and announcing the appointment of representatives of that society to attend this meeting.

At the conclusion of the reading of the above communication, Secretary Swenson said that invitations were sent to the officers of all the street railway associations throughout this country and Canada, and also to all of the boards of railroad commissions throughout the country and he had a large number of responses.

The communications were referred to the committee on resolutions.

Now, if I may be excused for a time, I would ask Vice-President Beggs to kindly preside over your deliberations.

Hon. John I. Beggs, first vice-president, then assumed the chair, on account of the necessary absence of President Ely and said that the president had requested that a statement be made to the effect that the meeting of the Manufacturers' association would be tomorrow, Thursday, afternoon instead of this afternoon as previously arranged. He then stated in reference to the report of the committee on membership, that the committee had not prepared a formal report, as nearly all of the statistics and the results of the work which it accomplished, are embodied in the report of the secretary and of the teasure, which eport had been presented.

The committee on "Compensation for Carrying Mail" asked the indulgence of the association to permit the formal report to be made upon that subject tomorrow. It was so ordered.

Mr. E. G. Connette, of Worcester, Mass., then read the report of the committee on "Subjects," as follows:

The report was received and ordered spread upon the minutes of the association and published in the proceedings.

Secretary Swenson then read the report of committee on "Car Wiring." The report appears elsewhere.

This report was received and ordered spread upon the minutes of the association.

Mr. H. C. Page as chairman of the committee on the "Standardization of Equipment," then presented its report, in which was briefly summarized the work done by the "Standardization" committee of the Engineering association. Mr. Page's committee commended the work which had been done by the Enginering association committee and the assistance which had been given by the central office of the association which, under Mr. Swenson, had been charged with the duty of sending out inquiries and compiling the data received. The opinion was expressed that while it might not be possible to definitely determine any standards at this meeting yet great advantages were expected from the work of the committee.

Vice-President Beggs then called for discussion, stating that the work of this committee had of necessity been limited, because it was not possible to do a great amount of work until the basic work had been accomplished by a similar committee from the engineering branch of the association. They have done a very large amount of work in this same line; he assumed that a great many of these technical matters would be looked after and be given more particular attention by the co-ordinate associations.

Mr. Page called for the report from the engineering committee which was appointed yesterday.

There was no representative of the Engineering association who could respond to the suggestion made by Mr. Page.

Vice-President Beggs suggested that hereafter, it might be desirable to have some arrangements made by which the reports of the co-ordinate associations might be brought before the association for discussion by the members of the association who might not have the opportunity of participating in the discussion of the co-ordinate association.

Mr. W. E. Harrington, of New York City, then presented the report of the committee on "Promotion of Traffic," which appears elsewhere.

Mr. W. E. Harrington stated that the committee submitted the resolutions with the thought of obtaining an expression of the opinion of the members regarding this work.

Vice President Beggs thought it would hardly be proper for the association to adopt the report with segregating the various resolutions and passing on them independently, because to adopt the report as it has been presented would possibly commit the association to the adoption of the resolutions embodied in it, on which there might be a difference of opinion.

Mr. E. G. Connette, of Worcester, said it would possibly be an appropriate course to refer that report to the executive committee, so that the various suggestions contained therein could be properly referred to sub-committees, or special committees for consideration and recommendation. He made that as a motion. (Seconded by Mr. H. C. Page.)

Vice President Beggs in putting the question said that it was his judgment that such a course would be simply postponing action on the matter, to which this committee had already given a great deal of consideration, and in order that the matter might be brought before the association in concrete form they had prepared these resolutions. The motion would simply postpone the matter without having accomplished anything.

Mr. Connette inquired if the association as an association should adopt the resolution pertaining to parks, what would be the effect of such action? He thought it would not necessarily require each member of the association to adopt the recommendation contained in the resolution. He did not see any other course except to make a motion that the report be received and spread upon the minutes, and allow the suggestions to be accepted or rejected by the members of the association as they saw fit.

Vice President Beggs suggested in order to bring the matter before the association in proper form that the resolutions be considered seritim.

Mr. Connette inquired what would be the effect of any action, whether it was negative or positive, in regard to the resolutions? They would get the benefit of the discussion, but so far as the action upon the resolutions is concerned, what would be the effect?

Vice President Beggs replied that there would be no effect at all except that it might impress the members who would hear the argument. Recommendations such as were embodied in this report did not bind the members of the association.

In reference to the first resolution Mr. Harrison said that by reference to the analysis of the data sheets it would be seen that 74 per cent of the replies were in favor of that proposition, and that was the reason of embodying that in the resolution as an expression of approval. The idea of presenting the resolutions was to bring out the discussion that would naturally ensue from putting the matter coldly before the association and saying that the association was or was not in favor of a certain proposition. He had no particular arguments to present either for or against the resolutions except the expression which was secured from the replies of the membrs of th association who filled out the sheets.

Vice President Beggs did not believe, except in rare cases, in railway companies going into the matter of entertainment such as was contemplated in this resolution. He said a large amount of money had been lost by railroads going into a business they did not understand and should not be interested in at all. He believed in railroads giving assistance in some indirect manner to the promotors of these enterprises. Some of them were very profitable, but he should deplore it if the association passed that resolution in the manner in which it was set forth in the report. He thought a great many companies which years ago went into this thing lost large amounts of money. There were some railroad companies that would pay a bonus to some one who would take the parks off their hands.

Mr. Robert McCulloch, of St. Louis, said there did not seem to be any disposition to discuss the question, and thought it much better to accept this report and thank the committee for the trouble and pains they had taken to give so much information so thoroughly presented in such form that it could be referred to. He suggested passing a vote of thanks to the committee for the thoroughness with which they have done their work, without committing the association to the views expressed in the report. (The motion was seconded and carried.)

Mr. H. J. Davies, of Cleveland, chairman, presented the report of the committee on insurance. It appears elsewhere.

Mr. Davies, speaking for the insurance committee, said he hoped the association would permit suggestions from any one who is interested in this subject, whether a representative of a street railway or not.

Mr. C. H. Harvie, Knoxville, asked if the committee had struck any snags in the state laws in investigating the question.

Mr. Davies said he did not know that they had examined the laws of every state, but added that the companies that have been organized on a plan approved by the committee have been organized in Ohio under the laws of that state and the plans of organization approved by the insurance commissioner of Ohio.

Mr. H. A. Robinson, of New York, said it seemed to him an impossible proposition as far as New York is concerned to introduce this character of insurance. New York properties are covered by large mortgages ,in each of which the company making the mortgage has agreed to procure insurance satisfactory to the trustee of the mortgage and also in a number of the leases where the properties of other companies which are held by wholly independent stockholders, insurance must be given which is satisfactory to their boards of directors. He did not think it is possible to get attorneys or officers of trust companies in the city of New York to agree to take insurance for the benefit of fifteen or twenty millions of dollars of bonds in the policies of mutual insurance companies organized under the laws of Ohio. The difficulty was met of accepting insurance of this kind in the State of New York, owing to the peculiar insurance laws there which provides against outside insurance, except by going through certain formalities taken before the commission of insurance at Albany. It did not seem to him exact protection to bondholders to give them insurance of this character, when it is necessary for the bondholders to go to the State of Ohio to get the bills paid in case of a loss. It did not seem to him fair treatment of the bondholders to have a contract made for their benefit under the laws of the State of New York. He had gone into this question somewhat extensively with a gentleman from Missouri. They came to the conclusion it was impracticable, as far as the New York City company was concerned, to enter into this form of insurance.

Mr. B. E. Loomis, of New York, said he represented 26 fire insurance companies which lost about $80,000,000 in the San Francisco conflagration. For six years they had been carrying on inspection of street railway and power stations throughout the United States. They had made it a point to recommend improvements which would reduce the rate. They carried on the sprinkler tests in Newark. He had called the attention of the Car Wiring committee to the sprinkling tests that have been made for the protection and improvement of the street railway properties. He operated with the Car Wiring committee which was appointed some five or six years ago. The Car Wiring committee was also invited to attend the various tests held by the insurance companies of Newark. He said that all of this work undertaken by the insurance companies, the American Street Railway Association had invited, and as a result of this work, even five or six years ago, the reduction in the rates of insurance on the various street railway properties throughout the United States had been very material, in some instances as much as 75 per cent. He thought the insurance companies were more than willing to co-operate with the street railway companies. He was talking now for 26 companies and would say very freely and frankly to everyone that the National Board of Fire Underwriters would be glad to make an appointment with a representative of the street railway association to form rules and formulate schedules and to adopt standards of insurance which would be mutually satisfactory to both parties concerned. He had the assurance from the presidents of a number of insurance companies that such a committee would be appointed to meet with a committee of the street railway association to develop some system of insurance which would be mutually satisfactory. He thought that was the only system of co-operation which could be successful, because, with any one company, it was found hard to assume a line of insurance, but with 25 companies, having been in business for years and able to withstand three or four conflagrations like that in San Francisco, he thought they were well worthy of recognition in a proposition of this kind. He believed the railways could secure thorough co-operation from insurance companies. They would give a reason for the former rates and tell them, instead of only one-third of the premiums having been paid back the loss ratio has been over 85 per cent.

Mr. Henry A. Staats said he represented twenty-four traction companies in the matter of insurance. He first wished to reply to Mr. Robinson. The kind of insurance he had in mind and the kind to be presented for consideration were different in character. The kind of insurance wanted for the American Street Railway Insurance Company was a stock insurance with a capital of $500,000 and a surplus of $500,000 before a single policy was issued. That would enable a company to enter any state in the Union and policies would be made acceptable at any bank or any trust institution. The capital of the company would be subscribed by individuals of the various railway companies representing this association. Twenty-four companies had already subscribed to the American Street Railway Insurance Company and it had been organized under the laws of the state of Ohio.

Replying to Mr. Loomis, and in reference to the twenty-six stock companies who would be willing to appoint a committee to treat with the members of the American Street and Interurban Railway Association, or with the traction companies, he said they had made that statement for the last fifty years, on all classes of property, and particularly during the last five or six years with reference to railway properties, but he said his audience was simply the servants of the so-called old line or stock insurance companies. They did not give the best possible rates of insurance. He stated that some of the manufacturers of the United States had been banded together for the past seventy years to carry their own insurance, and some of the better classes of manufacturing properties today are carried by the Factory Mutual Companies of New England at a rate of 8½ to 15 cents on each $100 of insurance carried. He believed a co-operation of the traction companies for the purpose of carrying their own insurance would be better than to attempt to co-operate with the old line companies and permit them to make their own rules and regulations, and low rates temporarily, and after competition has ceased, then to put the rates on again. That was the old story. They would give temporarily a low rate of insurance and that rate would afterwards be raised when the competition ceased. The only way to maintain competition was through co-operation in an insurance organization that the railways can call their own and then they could say to the old line companies, "If you wish to carry a part of our insurance you can carry it at such a rate." The position now taken by the old line insurance companies was: "You install automatic sprinklers, fire extinguishers here and a hose there, have a watchman to make a tour with a watchman's clock and we will write your insurance for $1.15 or if we have competition we will write it for 15 cents. He declared that was the position taken in Cleveland on one rate with which he had been working. They formerly paid a rate of $1.50, and when a little competition was brought to bear on the old line companies they said: "We must not let that business get away, we must kill this little organization in its incipiency; if we do not it will get to be a big thing and we will not be able to control the insurance of traction properties and electric light and power stations." So they made a flat rate of 15 cents, which had been increased to 18 cents, on about four millions of business. The Twin City Rapid Transit Company of Minneapolis and St. Paul proposed to come in and help form this insurance company. The line of stock companies got their heads together and said, "We can not let that business go; we must kill this little organization, and we will make the company a 15 cent rate." He declared that those who were familiar with insurance matter knew that they could not carry electric light and power station property for 15 cents and continue to do it for any length of time. The low rate was given for the purpose of nipping the new company in the bud. He believed if the report of your insurance committee was studied there would be found in it sufficient reason to warrant the companies in coming out and standing on their own bottom and making their own figures for insurance rather than to be dictated to by either the stock insurance company or the mutual insurance company.

He called attention to the fact that there was connected with this association an accountant association and other associations representing different departments and recommended an insurance association, made a part of the present association, so that the railways might get the benefit of the seed which had been sown for their benefit. The insurance could be increased indefinitely. The eighty million dollars paid in California came out of the pockets of the insured. The speaker asked why the members did not form their own insurance company, divide the profits among themselves and simply pay the actual loss and expenses that accrue in this particular class of business. The risks were isolated, and not subject to total loss. The Columbus Railway & Light Company had risks located at different parts of the city. To make a total loss it would be necessary to have the city entirely destroyed. In the establishment of this insurance organization there should be connected with it an inspection bureau and competent inspectors and engineers employed to look after its interests. If fifty or sixty or one hundred traction companies got together and deposited in an insurance fund one per cent of the earning power of their roads annually, it would create a fund which would reach perhaps three or four millions of dollars and out of that fund simply pay the losses. The business would be looked after scientifically, inspected regularly and taken care of just as any other business. He said that at present that particular part of the business was being taken care of by strangers and they had no particular love but for dollars. They would reduce rates of insurance very low in order to kill this little organization which had been started. The question was whether the association would co-operate to a point where it could carry its own insurance at cost and that cost even on unprotected properties would be brought down to about 3-10th of one per cent. These figures were obtained after very careful investigation made by the chairman of the committee, Mr. H. J. Davis. He received from 420 railways replies to his letters, giving the actual figures, showing the amount of premium they had paid, the amount of losses they had sustained, and the actual fire loss amounted to only 27.66 of the premiums paid. He took issue with Mr. Loomis when he said it cost 88 per cent of the premiums to cover power house losses and electric light and power stations. The speaker was representing the interests of the traction companies and not the interests of any particular organizations. With their co-operation he could enable them to obtain their insurance at actual cost and that cost would be less than it could be obtained for from the old line companies who have got to make large profits to satisfy the stockholders.

Mr. E. R. Townsend, of Chicago, thought Mr. Staats had given a very nice account of the so-called insurance at cost, but he inquired what that cost was. Could it be figured year after year just what that cost was going to be? He represented the stock companies of the middle west in the traction work. A few electric light and traction companies combined could not take care of their losses as well as the insurance companies having a capitalization of $80,000,000,000. They spread their losses over all the country and their eggs were not all in one basket. He had followed this traction business from time to time, its cost, and the factors necessary to produce good business, and he had concluded from this research that stock companies could carry the liability at a very low figure. He had been making insurance rates of late subject to conditions that the insured should put in certain improvements which should warrant a reduction in the rates. The elimination of small defects, corrections in the electrical equipments, physical hazards, etc., would give a better class of properties, and the stock companies stood ready and willing to offer any suggestions for correcting any such defects and when this was done would give insurance at a lower cost. For some years his principals had maintained a department and requested the insured to invite inspection. They visited the properties and suggested what the insured could do to lower his rate. He determined the cost himself. He would like all the members of the association who are interested in this matter to make a request of their secretary for inspection and he would forward it. They would be glad to give it their best attention. He said the quality of this business of late years had improved; that properties were becoming consolidated under one management and some one was delegated to take care of the properties; the moral hazard was improved and that entered into stock insurance rates. He believed he could give insurance at cost. They had never made any specially low rates to meet competition, but had studied to improve conditions so that they could make these rates. They had reduced the rates because they had established a department of inspection.

Mr. Staats said that up to a little less than two years ago it was impossible to get a marked reduction on power house property simply because there was no competition and up to two years ago the stock companies did not know what the insurance was costing them; that the gentleman ignored the matter of competition but had to admit that they had made substantial reductions in rates during the past 18 months and that was the time when this proposition of getting the railway companies to figure on the carrying of their own insurance was started.

Mr. Loomis said he had been hammering at the insured to make improvements. This department was started some two or three years ago and they tried to educate the people along the lines of improving their property from an insurance standpoint. The managers of the properties had not had time to look over the properties and put them in the condition that the underwriters desired. They had made special efforts to visit the risks and point out such little factors of danger as could be eliminated and allow certain deductions in their insurance.

Mr. Staats asked Mr. Loomis if his companies ever made a proposition to this association to reduce the rates, or whether any of the old line companies had come here and voluntarily offered in consideration of the companies making certain improvements that they would reduce the cost of insurance. He did not believe that anything of that kind had ever happened.

Mr. A. H. Ford, of New York, said he had been very much interested in the discussion but was disappointed in the manner it had been handled so far. Only one man who was vitally interested in this insurance question had spoken. He had heard the discussion between the insurance men and supposed they would stay there discussing the subject all night. He was very much interested in this question, because he had had some experience with it in the past and especially in the last year. He was primarily a mutual insurance man. He tried in every way to take a little combination of properties and organize a mutual insurance company among ourselves and thought he had accomplished his purpose and started in with $150,000 of an insurance fund and intended to build that up to $500,000. He thought that would be a respectable insurance fund for the properties to be protected. He said he got the inspiration from Mr. Krueger, of Philadelphia, who told him he had $1,200,000 in insurance bonds for the protection of the property of the P. R. T. Company and it operated very successfully. He found state laws against the scheme. In the first place the corporations themselves could not go into that fund. In the next place he found difficulties in the state laws that prevented one company from being responsible for the losses of another and other difficulties which could not be surmounted. About that time he had a number of conversations with Mr. Staats and a number of letters from Mr. Davies about these companies that they were interested in. He was not, however, prepared to subscribe to the capital stock in the name of the companies he represented. He was prepared, however, to give them a certain line of insurance in each one of the properties; they were only prepared to carry a limited line. He saw that he could not handle the insurance proposition through that insurance company at that time. Since then the company had been organized with a capital stock of $500,000 and a surplus of equal amount, and it should be able to carry a very fair line of insurance. He first took up the consideration of the lighting properties. He was paying a little over one per cent to the old line companies, and insured that in the New England Factory Mutual. Where our premiums used to be $400 he now insured that property for $360. They had during the past two years improved the character of all their risks, so that they were in better shape to secure lower rates than they were previous to that time. When he found the power houses were constructed on the lines laid down by the Factory Mutual Companies he told the old line companies that they would insure the power houses in the Factory Mutuals unless they gave a better rate than they had been heretofore able to secure on the whole line. This property was inspected and found in better condition than when it was last inspected. He believed the work was done thoroughly with the idea in mind, if possible, of reducing the rates on these risks. Three of these properties were written at greatly reduced rates, partly on account of the improved condition of the property and for other reasons. He believed the managers of these companies usually paid less attention to the insurance conditions in their property than to any other single question that they had to deal with. He believed if the properties were put in proper shape, not to get a lower rate of insurance, but to protect against the destruction of cars and machinery, which is necessary to the conduct of the business, members would have no difficulty in dealing with the insurance question. He thought the old line companies would come and propose lower rates, or if contracts were only three months old and it could be shown conditions are improved they would give the benefit of reduced rates and be willing to make a new contract for the remainder of the period. He thought Mr. Staats was working in the right direction, but what he gave was not adequate. Mr. Robinson had hit the nail on the head. The trustees of mortgages would not accept that insurance. They had told him in the organization of his mutual insurance company that the trustees might come in and object. He was relying upon his powers of persuasion to satisfy the trustees of the mortgages. In some of their mortgages the trustees were the custodians of the insurance and could do what they pleased with it, cancel it, or place it elsewhere. If Mr. Staats would organize a company with $20,000,000 of capital they could then talk to him about going into his insurance company. He did not believe a one million dollar company was sufficient. He had about $700,000 of insurance placed about three months ago, and in view of the impaired condition of some of the stock companies by reason of the recent large fires in several cities he could only get one half of it in the old line companies and the balance of it he had to take in English Lloyds. The report of this committee came out as recommending that all the traction companies go into this insurance company. That was the way he read the report. He would be sorry to see that recommendation go out for he did not believe for the reasons stated that the association was prepared to make any such recommendation.

Mr. Staats said it was not the intention of the American Railway Insurance Company to take the entire insurance on any one property, but simply to take a reasonable portion of it and in so doing to compel old line companies to lower their rates down to a reasonable point.

Mr. H. J. Davies said the insurance committee had not recommended that the members of the association place their insurance with any insurance company. The insurance committee expressed the opinion that the traction companies in the country could unite and carry their own insurance in some way. The insurance committee ought not to represent any insurance company. It ought not to recommend any mode of insurance as against any other mode that might be in competition with it. The insurance committee ought to hear suggestions from all sources and advise as to the best method, first, to protect properties against loss by fire by proper equipment and construction, and secondly, to insure against any money loss that might result from a fire which might occur. The insurance committee was not interested in any insurance company. If another insurance committee were appointed to continue this work during the coming year it ought not to be interested in any insurance company or any plan of insurance. The suggestion of Mr. Loomis as representative of the National Board of Fire Underwriters to confer with a committee of this association was a good one. The committee did not condemn the stock insurance companies; it should not; it should confer with the representatives of the stock insurance companies, accept recommendations from them and get them to co-operate with it for the benefit of the traction companies.

Mr. B. E. Loomis wanted to say one word for the stock companies, so far as the co-operation of the stock companies with the association was concerned. It was said that they had not come forward. They did not do much talking if they could get out of it. The stock companies were perfectly willing to co-operate with the committees at any time, to meet with them and arrange schedules and satisfy them they were willing to do anything in their power on a co-operative basis with the street railway companies. The insurance companies were willing to co-operate if the railway companies would co-operate.

Vice-President Beggs said he had given a great deal of attention to this matter and desired to say a word or two in connection with it, having, for some years, been in the fire insurance business and now being required to place many millions of fire insurance. The justification for the appointment of this committee was evident today. This was the first time he had seen one of the old line fire insurance companies send representatives to a meeting to say anything to indicate that they cared about railway business. A few years ago such properties were on the prohibited scale, and, as Mr. Ford said, it was difficult now in certain sections of the country to cover large lines of insurance. It was apparent the old line companies had awakened to the fact that if they treated railway companies as they had too often been treated in the past, that perhaps they would put themselves in a position to help themselves. The suggestion of Mr. Ford met his hearty approval; in fact, he might state that this proposition to raise $1,000,000 of capital for this company was largely his own. Mr. Staats and those in Cleveland who were interested in this proposition sought to interest the speaker in the company for which it was proposed to arrange for $500,000, half capital and half surplus. He took the position it was too small to be of any moment whatever, even as a balance wheel to the old line companies. One of the difficulties under which the old line companies labored was the 25 per cent commission which was one of the first charges against fire insurance and from which they could not get away and this money could never come back to the insured. He had recently had some policies cancelled by some of the companies and others were likely to be cancelled in the future, and, therefore, he thought it highly important that this association should continue this work. As Mr. Staats had well said, if this association had among its members a good, strong stock company, complying with the laws of the most stringent state in the Union and having within their own ranks the best ability to inspect these risks and know what were proper precautions to put upon them they could make a success of the undertaking. They could employ as good men as could any fire insurance company in the United States to conduct this business and they would know what the insurance was costing and would have some guide when they came and said they should pay so much money, whether that was right or not. They could not organize a company that would be large enough to carry all these properties, but there was enough ability in the association to organize a company as to give a guide as to what were the proper charges.

The meeting then adjourned until Thursday morning at 10 o'clock.

ENGINEERS' ASSOCIATION, WEDNESDAY AFTERNOON AFTERNOON SESSION.

The American Street and Interurban Railway Engineers' Association was called to order by President Adams at 2:45.

The first order of business was the Question Box.

President Adams called for the report from the committee appointed to prepare resolutions in reference to the Standardization committee. Mr. Winsor, the chairman of that committee reported as follows:

"The committee on Resolutions, to which was referred the vote of the Central Electric Association on certain standards, begs leave to offer for your consideration the following resolution:

"Resolved, That the resolution of the Central Electric Railway Association on the subject of Standard Brake Shoes, Journal Boxes, etc., dated September 27, 1906, be referred to the Standardization committee, with the request that that committee submit as soon as possible to the members of this association their report on these subjects, in whole or in part, so that the members may anticipate what the standards will finally be.

Signed: Paul Winsor, G. J. Smith, Thos. K. Dell, John S. Doyle.

The resolution was adopted.

Mr. E. W. Olds desired to mention something not mentioned in the report or discussion: the size of the motor bearings to the axle. He thought it would be well for the committee to arrive at some conclusion regarding that size. The importance of that appeared in his own experience. He said he was having some heavy cars built at the present time and the truck and the wheel fit and the gear fit were arranged for the larger axle, but the motor would not take such an axle as he wished to use, so that in order to cover that he was making the plans of the truck strong enough and large enough to receive what he thought without a doubt would become the standard later on.

President Adams requested that no further discussion be had on that matter as the subject was closed.

Mr. Evans, of Indianapolis, said there was another matter that ought to be taken in hand, and that is the size of the wheel fit. It was his opinion that it has been too small for a large number of axles. He was anxious to get this in such shape that Mr. Olds, would have a chance to give a great deal of assistance on those things.

Mr. Simmons offered the following resolution:

Resolved, That the American Street and Interurban Railway Engineering Association at this time extend to the American Street and Interurban Railway Association, and more especially to its president, Mr. W. Caryl Ely, its thanks for the great amount of sympathy, assistance and encouragement given in the reorganization proceedings during the past year. (Carried).

The association, appreciating the vast amount of work necessary in organizing the Standardization committee, and realizing the splendid ability displayed, extended a vote of thanks to Mr. Henry Wallastedt, commending him for his work on that committee.

Resolutions of appreciation of the good work done by our president and his associates during the past year were also passed.

Mr. Green presented the report of the committee on nominations, as follows:

For president, H. H. Adams, superintendent of shops, the United Railway & Electric Company, Baltimore, Md.

For first vice-president, Fred G. Simmons, superintendent construction and maintenance of way, Milwaukee Electric Railway & Light Company, Milwaukee, Wis.

For second vice-president, J. S. Doyle, superintendent of car equipment, Interborough Rapid Transit Company, New York.

For third vice-president, Paul Winsor, chief engineer motive power and rolling stock, Boston Elevated Railway Company, Boston, Mass.

For secretary and treasurer, S. Walter Mower, general manager Southwestern Traction Company, London, Canada.

For members of the executive committee: F. H. Lincoln, assistant general manager, Philadelphia Rapid Transit Company, Philadelphia, Pa; Fred N. Bushnell, chief engineer, Rhode Island company, Providence, Rhode Island; W. T. Dengan, engineer maintenance of way, New York; H. B. Fleming, chief engineer, Chicago City Railway Company, Chicago, Ill.

Alfred Reed was instructed to cast the ballot of this association for the gentlemen nominated.

THE ACCOUNTANTS' ASSOCIATION.

Wednesday Afternoon Session.

President Brockway called the meeting to order at 2:45 o'clock and introduced Mr. A. Stuart Pratt, general auditor and treasurer of the Stone & Webster Company of Boston who read a paper, "The Use of Curves in Statistics," which was discussed with great interest by the members.

A recess was then declared and the members assembled upon the grounds for the purpose of being photographed in a group. On reconvening, Mr. W. F. Ham, of Washington, chairman of the committee on "Standard Classification of Accounts," read the report of that committee and also of the commitee appointed to attend the convention of the National Association of Railroad Commissioners, held at Washington, D. C., April 2 to 5, 1906.

On motion, these reports were received and the sub matter discussed, whereupon it was moved by Mr. C. N. Duffy, of Milwaukee, "That it be the sense of this association that a car is a car and a mile is a mile," and that the question as to what constitutes a trailer car mile and what constitutes a car mile be referred to the existing committee on "Standard Classification of Accounts," to report next year.

The reference was ordered.

Mr. Fred E. Smith, for the committee on Nominations, presented the following report, which, on motion, was adopted and the several nominees duly elected for the ensuing term:

President—C. L. S. Tingley, of Philadelphia.

First vice-president—J. H. Neal, of Boston.

Second vice-president—E. F. Bryant, of Bridgeport, Conn.

Third vice-president—C. L. Wight, of DesMoines.

Secretary and treasurer—Elmer M. White, of Birmingham, Ala.

Executive committee—W. B. Brockway, of Yonkers, N. Y.; H. T. Bunn, of Knoxville, Tenn.; A. Stuart Pratt, of Boston; H. S. Swift, of Toledo.

President Brockway requested the members to assemble as promptly at half past seven as possible for the accountants' dinner in the evening.

Adjourned until Thursday, October 18, at 10 a. m.

WEDNESDAY SESSION OF THE CLAIM AGENTS' ASSOCIATION.

The Claim Agents' association met pursuant to adjournment at 1:00 o'clock. Mr. H. C. Bradley, adjuster, Chicago Union Traction Company, then presented his paper on "Methods of Management of Claim Department."

Resolutions of regret at the untimely death of Mr. Feeney were passed.

A vote of thanks was extended to the Columbus Railway & Light Company; the Scioto Valley Traction Company and the Columbus, Delaware & Marion Railway Company for courtesies shown; and to Mr. Silcox of Philadelphia for the stereoptican exhibition; to President Rhoades, Secretary Davis and the officers of the executive committee of the association.

In response to the suggestion contained in President Rhoades' annual address, a committee of five was authorized to be appointed in ways and means for the purpose of carrying out objects stated in his address. The president announced that this committee would be appointed after conference with the executive committee. It was suggested by Mr. Weh that this committee work in conjunction and in co-operation with the Alliance against Accident and Fraud.

Mr. Brown of Schenectady, New York, handed to the secretary for the purpose of reading to the association a bill which was presented to the last session of the New York Legislature with reference to ambulance chasing and bicycle lawyers. The bill was read and was referred to the ways and means committee.

It was voted that the secretary furnish to each member of the association a complete list of the companies, members of the parent organization, and also the name and address, so far as obtainable, of the claim agents representing each respective company, and by an asterisk indicating the active members present at this convention.

On motion of Mr. Dorsey, duly seconded and carried, the following committee on nomination was appointed: Messrs. Dorsey, Hardin, Nickel, Harrison and Dunlop.

It was then moved by Mr. Davis and seconded by Mr. Goshorn that the president be authorized to appoint an employment committee consisting of five members, which committee was suggested and recommended in one of the addresses made to the association.

The president announced that this committee would be appointed after a conference with the executive committee.

The committee on nominations presented its report as follows:

For president, S. L. Rhoades, of the Philadelphia Rapid Transit Company; for first vice-president, Henry C. Bradley, of the Chicago Union Traction Company. For second vice-president, Andrew J. Farrell, International Railway Company, Buffalo, New York. For third vice-president, W. F. Weh, Cleveland Electric Company, Cleveland, Ohio. For secretary and treasurer, B. B. Davis, of the Columbus Railway & Light Company, Columbus, Ohio.

The secretary was instructed to cast the ballot of the association for the election to office of the various members nominated for the respective positions.

President Rhoades then made a brief and appreciative acknowledgment of the honor conferred upon him in re-electing him as president, stating that while he did not believe the administrative office of such an association should remain in the hands of any one man for a term longer than one year, yet inasmuch as the association had seen fit to re-elect him, he would do all in his power to see to it that the association prospered under his guidance, aided by the efficient assistance of the other officers of the association.

First Vice-President Bradley, Second Vice-President Farrell, Third Vice-President Weh, and Secretary and Treasurer Davis, responded in turn, expressing their appreciation of the honor conferred and pledging their best efforts for the future.

On motion of Mr. Vories, seconded by numerous delegates throughout the convention hall Col. Samuel Dorsey of Denver, Colorado, was re-elected to the important and arduous position of sergeant-at-arms. Mr. Dorsey replied, saying that he cheerfully accepted the appointment and that he would try to preside with dignity for the ensuing year in attempting to fulfill the duties of the position. The president then appointed for the ensuing year the following members of the executive committee: Messrs. Charles B. Hardin, of St. Louis; Peter C. Nickel, of New York City; F. W. Johnson, of Bridgeport, Conn., and E. C. Carpenter, of Anderson, Ind.

It was then moved, seconded and carried, that the president appoint a committee of five, to be known as the Employment committee and to receive the names of claim agents desiring to change their positions or to secure new ones and to answer communications from presidents or general managers of railway companies desiring to procure the services of competent adjusters and claim agents.

On motion, duly seconded and carried, the association then adjourned sine die.

QUESTION BOX, ENGINEERING ASSOCIATION.

1. Where feeder wires are partly underground and partly overhead (same circuit) have you experienced much trouble from lightning injuring underground cables, and how do you arrange lightning arresters?

Place lightning arresters at each end of the cable, that is, one at the station, and one at the terminal end; then install lightning arresters on the line every 500 feet.

2. What do you find to be the most reliable lightning protection for stations on 550 volt direct current service, also on 11,000-volt transmission lines?

(1) For 550-volt direct current stations a lightning arrester at the station on each feeder, and one on each machine gives good protection, provided the line is also properly taken care of with arresters spaced from 500 to 1,000 feet apart.

(2) A water resistance thrown in at the station whenever a storm is approaching is a good protection.

3. What advantage has the 6-volt splice bar over the 4-volt?

(1) On the modern and approved type of rails now generally in use and with the improved types of joints on the market, we do not think that a 6-volt splice-bar or joint has any advantages whatever.

(2) Fifty percent more strength to resist strain in every direction.

4. What is the best spacing for interurban trolley poles?

(1) This depends somewhat on the type of overhead to be constructed, for the ordinary direct connected trolley line with No. O or No. OO wire from 100 to 110 feet seems to give entire satisfaction.

(2) Poles should be spaced on interurban lines 100 feet apart on straight lines, and 50 feet on curves.

5. What are the advantages and disadvantages of bracket arm, or center pole construction and suspension, as against side pole construction on interurban lines?

Bracket line is cheaper construction, if properly built, and poles more perpendicularly for carrying transmission lines. Side construction is not so rigid.

6. What do you consider is the proper height for trolley wire above the rail?

(1) The proper height for trolley wire above the rail is 20 feet or 22 feet maximum, and not less than 16 feet under any condition.

(2) Eighteen feet on straight line, increased to the height required by law over railway crossings.

(3) An average height of 19 feet, 6 inches gives good results.

7. On lines where speeds do not exceed 25 miles per hour should the trolley wire be kept as tight as it can be with safety, or should it be somewhat slack? Which condition will give the wire the longest life?

(1) Do not think it advisable to keep the trolley wire too tight under any conditions.

(2) On lines where speed does not exceed 25 miles per hour the trolley wire should be kept as tight as safety will permit. Tight wire gives longest life.

8. What is the proper tension for trolley poles with 4-inch, 5 and 6-inch trolley wheels, giving length of pole?

(1) 25 to 40 pounds with 14 feet poles.

(2) 16 to 19 pounds with 4-inch wheel and 13-foot pole, including wheel; 19 to 22 pounds with 5-inch wheel and 13-foot pole, including wheel; 22 to 25 pounds with 6-inch wheel and 13-foot pole, including wheel.

(3) The tension of trolley poles should be about 25

pounds against the wire with poles 12 feet long on interurban cars; for city cars 18 pounds against the wire, with poles 13 feet, 6 inches long is sufficient.

9. What diameter and weight of trolley wheels are best for use on cars in strictly city service?

(1) Five-inch to 6-inch, weight from 3 to 4½ pounds.

(2) A 5-inch wheel weighing about 2¾ pounds.

10. What diameter and weight of trolley wheels are best for use in interurban service?

Six-inch, weight about 4½ pounds.

For speeds up to 35 miles maximum, a 5-inch wheel, 2¾ pounds.

For speed above 35 miles, a 6-inch wheel, 3¾ pounds.

11. What mileage is obtained from trolley wheel bushings?

12. State the diameter and length of trolley wheel bushing used?

(Combined answer for 11 and 12.)

(1) Average about 4,000 miles on city for 4-motor equipments, with ½-inch bushing 1 9-16 inches in length.

(2) Average about 4,500 miles on 4-inch wheel for ½-inch by 1½-inch bushing. Average for 5-inch wheel with ⅝-inch by 1½-inch bushing, 6,500 miles.

14. What weight of rail has been found best adapted for and most economical on interurban lines?

15. Is an 80-lb. A. S. C. E. section of T-rail sufficiently heavy for present and prospective interurban traffic?

(Combined answers.)

(1) This is in course of evolution. We have adopted an 80-pound A. S. C. E. section of T-rail, and believe it the best for our conditions.

(2) Depends entirely on rolling stock. For most modern cars 100-pound rail is none too heavy.

(3) Eighty-pound A. S. C. E. section is all right for cars weighing up to 25 tons.

(5) Eighty-pound A. S. C. E. section of T-rail is considered sufficiently heavy for present and prospective interurban traffic.

16. What is the cause of corrugated rail on street railway tracks? What measures can be taken for its prevention? What remedy can be applied to rails which are already corrugated?

A comprehensive answer to any of the three parts of this question is impossible, and this is a subject on which a special committee might well labor for some time to come.

18. What is the best type of paving block to use against T-rail in paved city streets?

(1) We use a square granite block from 8 to 12 inches in length, and find that if care is used in laying such blocks and the abutting pavement no trouble is experienced. In brick pavement the plain brick is all that is required. A grooved block or brick is not necessary unless the ball of the rail is unusually deep.

(2) Brick moulded to proper shape where traffic is not too heavy. On streets where traffic is heavy and likely to follow the rails no pavement will stand. Other rail sections should be used.

23. Would the use of metal tie plates tend to lessen the electrolysis between rail base and spike head?

Where this electrolysis exists I believe a tie plate would only serve to accentuate it; proper bonding is the best remedy.

24. How many miles of interurban track can or should be maintained per trackman employed?

The general practice on interurban roads has been to maintain too few men for this work. The writer's opinion is that one man to two and one-half miles is nearly right.

25. What is the most advantageous width for rights-of-way for interurban lines?

(1) Unless the country traversed is unusually flat and level, 100 feet is advisable, as it provides for all ordinary contingencies except particularly deep cuts or fills.

(2) A right-of-way 60 feet wide is sufficient for most conditions.

(3) Interurban lines should have right-of-way 50 feet wide.

26. Which do you find cheaper in eliminating weeds from private right-of-way, chemicals or manual labor? If chemicals, what formula and method of applying can be used?

(1) Believe that a process of burning with a gasoline burner can be perfected which would be most efficacious.

(2) The use of chemicals is much cheaper than manual labor. There are several arsenic compounds upon the market for this purpose. They may be applied from a sprinkling car made of wood by using brass piping and valves.

28. What is the cost per cubic foot for the construction of a modern car house? State the type of construction and general features.

(1) An extensive car house and shop combined, built with brick walls, steel truss, monitor roof, which is covered with slate, not fireproof and without sprinklers, cost 5.8 cents per cubic foot.

(2) A car house built of reinforced concrete throughout, having roof supported on columns, all of reinforced concrete, equipped with sprinkler system, including aisle sprinklers, metal sash and wire glass, making a fire-proof building, cost 7 cents per cubic foot.

29. In a car house what is the best distance between track centers for a system of between 300 and 400 miles of track and operating from 500 to 800 cars?

(1) Track centers 10 feet, 6 inches can be used to advantage where the cars do not exceed 8 feet, 2 inches over posts. Increase this if you can afford it.

(2) Car houses should be built with tracks 15 feet center.

30. What is the most practical design for pits to be used in operating car houses?

(1) In a car house where inspection of cars is a large item, the pits arranged with depressed aisles are desirable. By using a deep girder rail it may be supported upon I-beams or columns every 10 feet. The aisle should be depressed 18 inches below the head of the rail.

(2) Sidewalks to be formed of concrete, using wide base rails anchored to walks or plates riveted to base of rails used to give bearing. Pits to be connected in pairs by passage ways. Drops for wheels should be placed on one or more pits.

(3) The most practical design for pits in an operating car house are those where the tracks set on concrete pillars, leaving the entire space underneath the tracks open. This is an economical construction, and gives plenty of space for ventilation between different pits, and by setting the girder rails in the concrete pedestals a rigid track construction is obtained. Between the tracks can be floored with one-half-inch openings between the planks. This will be found a considerable better construction than the usual mode of making a continuous pit for each track.

31. What proportion of the total trackage in the house should be devoted to pits?

(1) About 20 percent of the trackage should have pits.

(2) I would consider that the smaller car houses should have pits under all the tracks and for larger houses 50 percent of the tracks should be pits, arranged so that the cars pull over the pit end of the tracks upon coming into the house.

32. What is the mileage obtained upon armature bearings for the various types of motors?

(1) With oil lubrication packed with wool waste about 50,000 miles; oil lubrication with wick feed oil cups about 25,000 miles.

(2) Average mileage of armature bearings for Westinghouse 49 motors, 26,926 miles. Average mileage of armature bearings for Westinghouse 56 motors, 30,381 miles. Average mileage of armature bearings for Westinghouse 3 motors, 19,075 miles. Average mileage of armature bearings for Westinghouse 12A motors, 23,394 miles. Average mileage of armature bearings for G. E. 800 motors, 17,998 miles. Average mileage of armature bearings for G. E. 1,000 motors, 27,321 miles.

33. In case babbitt is used, what is the formula for it.

(1) In making babbitt metal for armature bearings for various types of motors the following formula will be found to be quite satisfactory: Tin, 82; antimony, 10; copper, 8. The copper should be added after the other mixture is thoroughly melted. As a simple shop test for testing babbitt metals of various makes to insure uniformity in the metal and also to determine approximately the material of which it is composed, a single drop test will be found to be of advantage. This should be arranged with a drop of a known weight falling a certain distance and a record kept of the number of blows required to break a bar of the metal of various compositions.

(2) Babbitt Formula: Tin, 64½; antimony, 9.5; copper, 2; lead 24.

34. What is the average of oil lubricated motor bearings on interurban cars equipped with four 50, four 75 or 4 100 horsepower motors?

With four 65 horsepower motors we obtain an average of 60,000 miles.

35. Have any oil cups been found to be entirely satisfactory to replace cups on motors not designed for oil?

(1) While it cannot be said that oil cups have been found to be entirely satisfactory to replace cups in motors not designed for oil cups, oil cups are a very great improvement over the original mode of lubrication, and if given proper attention (as required) periodical cleanings, a very much more satisfactory result will be obtained. A lubrication by wool waste packing and oil placed in the oil cups not designed for oil will be found to be considerably more satisfactory than the lubrication originally designed for these motors.

(2) Yes.

36. What is the best method of grinding a rotary engine's air valve?

We have rearranged an old hand drill to accomplish this work. this drill had an automatic feed wheel at the top operated by a lever and dog which engaged in the teeth on the feed wheel, the lever being operated by an eccentric on the driving shaft. The main spindle of the drill was extended through to where the feed wheel was, and in place of the feed wheel an arrangement was made to hold the valve with its face up, the valve seat was then placed on top of the valve and attached by springs to the lever operated by the eccentric. The operation is as follows: The machine is driven slowly by a small belt and pulley, which was substituted for the hand power arrangement; as the main spindle revolves the value is rotated, and the valve seat, resting by its own weight upon it, is moved from side to side by the motion of the arm; by the application of powdered emery and oil the grinding is carried on.

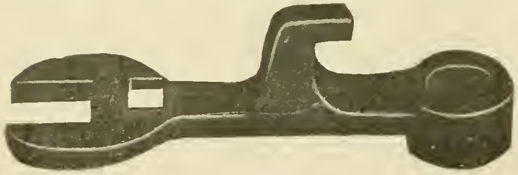


Figure 1.

37. What is the life and cost (per 1,000 wheel-miles) of cast-iron wheels, including grinding?

(1) On 4-motor equipments, city service cast-iron wheels average 40,000 miles.

(2) The life of cast-iron wheels in city service should be about 40,000 miles, and the cost per 1,000 miles about 70 cents.

38. What is the life and cost (per 1,000 wheel-miles) of rolled steel wheels?

(1) The life of rolled steel wheels should be at least 120, 000 miles.

43. Do hard brake shoes wear out the tread of the wheel faster than a softer shoe on a surface road?

No.

44. What is the best design of interurban brake hangers and hanging to minimize or overcome the chattering or "logging" of the brakes as the car is brought to a stop?

(1) There are several improved hangers on the market designed specially to meet this condition.

(2) A slide brake rigging, having a wearing shoe shrunk on the ends of the brake beams, and wear plates, which can be shimed in the brake slide castings, will meet this conditon satisfactorily.

47. Would it be best on an interurban car to have each motor separately fused in addition to the main circuit breaker?

Yes, the individual fuse on each motor makes the best arrangement in addition to the circuit breaker, particularly with 4-motor equipments.

48. What special provisions should be made whes building cars for limited service, to accommodate the commercial traveler and his baggage?

It would appear that the only special provisions which should be made when building cars for limited service to accommodate the commercial traveler and his baggage would be to build the car sufficiently long to permit three compartments, i. e., the baggage, smoker and coach compartments. This can be done very nicely with a car sixty feet long which will leave a baggage compartment, which will also accommodate the motorman and the necessary apparatus. Cars in service in this locality arranged in this manner are giving very good satisfaction.

49. Is there any compound which can be recommended for use in cleaning cars, and if so, what kind and in what quantity should it be used?

A cleaning compound composed of linseed oil soap, of which there are a number of makes on the market, has been found to be quite satisfactory for cleaning cars at the car station. 8 pounds will be found sufficient to clean a double-truck city car and 10 pounds to thoroughly clean an interurban car. This does not refer to cleaning a car preparatory to re-varnishing.

50. What plan would you recommend as best adapted for repair shop and car barn, operating about 45 suburban cars, where the ground is unlimited?

Where sufficient ground is obtainable a double-end barn and repair shop will be found to be a decided advantage. where the cars can pull through the repair shop end and undergo the necessary inspection and repairs, and pass on into the barn and out at the other end into service. This will be found a considerable saving in time and labor in handling the cars with the least possible expense.

51. Which is the more practical, a transfer table or double-end shop?

Where sufficient ground is available a double-end shop is a decided advantage over using a transfer table.

53. What are the average weights of cars? Give lengths over corner posts and over bumpers.

(1) Forty thousand pounds, including trucks and electrical equipment. Lengths over corner posts 29 feet; over bumpers 41 feet.

(2) Semi-convertible car, 30 feet, 8 inches over corner posts and 42 feet over bumpers; 4-motor equipments, weight 45,000 pounds.

Closed car, 28 feet over corner posts, 40 feet over bumpers; 2 motors, double truck, weight 29,230 pounds.

Convertible car, 30 feet 5 inches over corner posts, 41 feet over bumpers; 2 motors double trucks, weight 31,700 pounds.

Closed car, 23 feet over corner posts, 34 feet over bumpers; 2 motors, single truck, weight 22,286 pounds.

Open cars, 12-bench, 31 feet 9 inches over corner posts, 40 feet over bumpers; 2 motors, double trucks, weight 30,744 pounds.

54. How many roads having discontinued the use of sand cars, in order to decrease the number of flat wheels, and what has their experience been? Has it not resulted in an increase in accidents?

(1) Roads using steel wheels can dispense with sand cars, except when the rail is extremely bad.

(2) We do not use sand cars, but have four sand boxes on each car. The question of skid flats does not alone depend upon the use of sand cars, brake pressure, and the method of hanging the brake affect this problem as well.

55. How can the mechanical department best assist the manager to build up business of evening riding on an interurban railway?

Having the cars neat and clean and so designed that it will be a pleasure to ride on them, at the same time be sure that your electrical equipment is in first-class condition.

Kinks.

1. Combination reverse wrench which can be used on a road where General Electric type K controllers are used, and also the multiple unit type M, the right-hand end operating K-6, K-10 and K-11, and the left-hand end C-6, C-8, C-28, etc. This wrench is shown in Fig. 1.

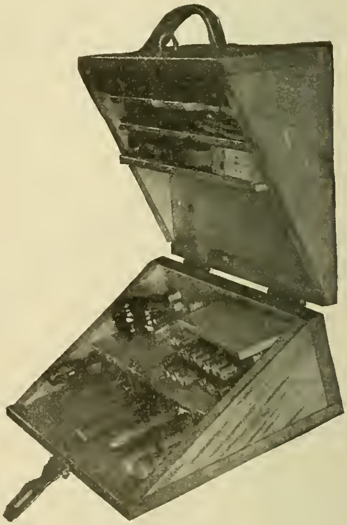


Figure 2.

2. Tool box for motormen. Its outside dimensions are 13x16½x6¾ inches. Figure 2 shows the box open. It contains the following:

1 red fusee.
1 green fusee.
1 8-inch flat mill file.
1 10-inch monkey wrench.

4 2-ply copper ribbon fuses, 800 amperes.
2 4-ply copper ribbon fuses, 400 amperes.
1 14-oz. machinist hammer.
4 ⅜x6 inch headlight carbons.
1 pair 8-inch side-cutting lineman's pliers.
1 combination reverse wrench.
1 9-inch screw driver.
1 8-inch flat cold chisel, ¾ inch octagon.
4 25-ampere cartridge fuses.
3 15-ampere cartridge fuses.
4 10-ampere cartridge fuses.
4 4-ampere cartridge fuses.
3 3-ampere cartridge fuses.
1 16-candlepower incandescent, white globe.
1 16-candlepower incandescent ruby globe.
1 1-ampere fuse wire.
2 150-ampere cartridge fuses.
1 roll Acme tape.
1 switch rubber.
6 railway torpedoes.
1 red flag.
1 trolley rope.
6 No. 6 rubber-covered cable.
1 pair rubber gloves.
1 padlock.
Weight of box fully equipped, 28 pounds.

REPORT OF COMMITTEE ON "PROMOTION OF TRAFFIC"

W. E. HARRINGTON, CHAIRMAN; H. E. REYNOLDS, H. F. GRANT.

The committee on "Promotion of Traffic" respectfully submit this, its first report.

The circular letter and data sheet herewith attached were sent to over 800 companies, and 98 replies were received as follows:

City lines	36
Interurban	16
City and Interurban	46
Total	98

Table I contains a summary of the replies to those questions contained in the data sheet which permit of a positive or negative answer, and shows the percentage of such replies.

Table II gives the names of the companies which sent replies to the committee, together with statistics valuable in analyzing this report.

Table III gives the summary of replies concerning direction signs, car and newspaper advertising.

Table IV describes the attitude of the railway companies toward newspapers and carnivals.

Table V summarizes the data relative to fares (one way and round trip) special cars, excursions, etc.

Table VI summarizes the data relative to picnics, special outings, theatre patronage from suburban points, real estate transactions, parks, and smoking on cars.

Table VII summarizes the data relative to zoölogical gardens, theaters, and bands in parks.

Table VIII summarizes the data relative to general attractions at parks, such as orchestras, midway, special days, and details concerning the manner of leasing and conducting parks.

These eight tables are followed by a complete analysis of the replies to the data sheet, and the attention of the association is called to this analysis.

The bibliography which follows the analysis relates to articles which have appeared in the columns of the Street Railway Journal and the Electric Railway Review.

Summary.

Your committee summarizes its findings as follows:

Parks.

That parks are desirable in connection with railway operation, but should not be operated with a license feature.

That parks should be leased, conditions permitting, rather than operated by officials of the company.

That it would be wise for the Accountants' association to draft a standard system of accounts for park operation.

That it would be wise to have on file in the office of the association applications and data as to park managers, traffic managers and parties seeking park leases.

Picnics.

That it would be desirable to provide small pavilions with stoves and fuel to encourage picnic parties.

Traffiic Manager.

That it would be desirable to develop in each company a department for the "Promotion of Traffic," to be presided over by a traffic manager or passenger agent.

Freight and Express.

That the association appoint a committee to especially investigate and report at the next convention as to the desirability of street and interurban railway companies engaging in freight and express business.

Mail.

That the rates obtained by railway companies for carrying United States mail are too low and should be materially increased. In the event of special cars being employed, the rate should not be less than an amount sufficient to cover operation, interest on investment, depreciation, and a reasonable profit.

Irregularities in Fare Collection.

That as the question of fares lost is the converse of the work of the committee on "Promotion of Traffic" it is found that systematic continuous car inspecting is both desirable and profitable.

Registration of Fares.

That the association appoint a committee to especially investigate and report at the next convention upon the "Registration of Fares" (covering both single and double registers). Use of tickets (with and without registration), and systems of checking and inspection in connection therewith.

General.

That interchangeable mileage is desirable.

That special cars, picnic and funeral cars are desirable.

That co-operation with theaters in having seats and nights especially assigned for various communities is desirable.

That the welfare of traffic is of sufficient importance to justify the organization of a separate affiliated association to be known as "The American Street and Interurban Railway Traffic Managers' Association."

Resolutions.

Your committee believes it desirable to embody the results of its findings in the form of resolutions for the purpose of permitting the association, as a whole, to express its attitude towards the various questions submitted.

(1) Resolved, That the American Street and Interurban Railway Association believes that parks operated in connection with railways are profitable and desirable as a means of promoting traffic.

(2) Resolved, That the American Street and Interurban Railway Association believes that a licensed park operated in connection with railways is not desirable or profitable.

(3) Resolved, That the American Street and Interurban Railway Association believes it better policy to lease parks, if the conditions permit, rather than to have them operated by officials of the company.

(4) Whereas the American Street and Interurban Railway Association believes it desirable to have on file, in the office of the secretary of the association, the names of applicants and desirable men capable of properly filling positions as traffic managers and park managers, and also a list of persons seeking park leases.

Therefore, be it Resolved, That this association instructs its secretary to keep such files and to take such steps as may be necessary to properly solicit applications and to complete the files by special inquiry, from the references given, to show the standing and qualifications of the respective applicants, and, further, to ascertain in each case, the compensation expected by the various applicants and the general terms under which the various applications are made.

(5) Resolved, That the executive committee of the American Street and Interurban Railway Association advise with the Accountants' association to the end that a standard system of accounting for parks be prepared.

(6) Resolved, That it is the sense of the American Street and Interurban Railway Association that it is essential for the "Promotion of Traffic" for railways to establish a traffic department presided over by a traffic manager.

(7) Resolved, That the "Promotion of Traffic" is of sufficient importance to justify the organization of a separate affiliated association to be known as "The American Street and Interurban Railway Traffic Managers' Association."

(8) Resolved, That the president of this association appoint a committee of three to especially investigate and report at the next convention as to the desirability of street and interurban railways engaging in freight and express business.

(9) Resolved, That the president of this association appoint a committee of three to especially investigate and report at the next convention upon the registration of fares (covering the use of both single and double registers), the use of tickets (with and without registration), and upon systems of checking and inspection in connection therewith.

Conclusion.

Your committee has prepared a file of the various time tables, advertising matter, maps and monograms, folders, pamphlets, and other descriptive material relating to the "Promotion of Traffic," which is submitted herewith and which will be open for examination after the convention at the office of the association.

The committee desires to express its appreciation of the co-operation of the various street and interurban railway companies in the collection of the data and other information which form the basis of this report.

The committee wishes to express its appreciation of the valuable assistance and co-operation given by the editors of the Street Railway Journal and the Electric Railway Review in the compilation of the Bibliography which forms a part of this report.

The committee desires further to express its appreciation of the co-operation of Messrs. J. G. White & Co. in the compilation of the data and statistics embodied in its report and to express its recognition of the personal services of Mr. J. Watts, of the operating department of that company.

The data submitted in this report was obtained through the office of your association and your secretary materially assisted in its preparation.

[Supplementing this report there are presented eight tables in which are summarized replies to the questions in data sheet No. 7. These tables occupy 30 pages of the report and constitute an exposition as to practice that will be found very interesting and useful. The tables are supplemented by an analysis of the replies, a number of the most interesting of which are published herewith, and the report is followed by a bibliography containing an index of articles published in the Street Railway Journal relative to the promotion of traffic, occupying about 1 1-3 pages of the report, and a similar bibliography of articles published in the Electric Railway Review and its predecessor, the Street Railway Review, comprising something over five pages of the report.]

Extracts from Analysis of Replies.

Excursions.—The general character of excursions is picnics. Of 14 companies replying to the question: "Do they pay better than provided the same energy were spent in the promotion of travel on regular cars?" 9 answered "Yes" and 5 "No."

Of 21 replies to the question: "Are they run on holidays and Sundays?" 11 answered "Yes" and 10 "No."

The maximum distance considered desirable for an excursion trip varies from 10 to 150 miles, and the time from one hour to six hours.

Of 20 replies to the question: "On an excursion do you try to give each one a special seat, or assign a certain number to a bench, or let first come be first served?" one company gives each one a seat, and 19 act on the principle, "first come, first served."

Three companies reply as finding accident risks serious and 22 companies as not finding them serious.

Eleven companies make an effort to increase travel in case of fire or accident and 23 do not. From the answers given to this question it is evident that some have understood it to mean fire or accident to company's property, while some have understood it to mean fire or accident to private property, along the company's lines, so that the replies to this question should not be considered as answers.

Of 25 companies replying to the question: "Do you call attention to specially high surf or unusual tricks of nature at points reached by your cars?" 14 answered "Yes" and 11 "No."

Picnics and special outings.—Seven companies work these up by advertising, and 23 companies by agents, solicitations, etc.

The special efforts to get picnics and special outings are made as follows: Ten companies by personal solicitation; 8 companies by letter and literature; 18 companies by personal solicitation, letter and literature.

Theater Patronage From Suburban Points.—The efforts made to stimulate this are by advertising, special service and special rates. Of the 36 companies giving their methods, 19 advertise, 12 give special service and 6 special rates.

Real Estate.—The methods employed to co-operate with Real Estate companies to promote traffic are by giving special rates, service and stops.

Smoking on Cars allowed on open cars as follows:

Five Rear Seats	3 companies
Four Rear Seats	8 "
Three Rear Seats	44 "
Two Rear Seats	11 "
One Rear Seat	2 "
Rear Platform	2 "
Both Platforms	1 "
All Seats	1 "
None Allowed	2 "

Allowed on Closed Cars as Follows:

Compartments	21 companies
Rear Platform	25 "
Front Platform	5 "
Both Platforms	11 "
Three Rear Seats	1 "
One Rear Seat	1 "
All Seats	1 "
None Allowed	19 "

Carousal.—Sixteen companies have given the diameter of their carousals. They vary from 30 feet to 80 feet, the prevailing one being 40 feet. The rows of animals vary from one to four; two rows is the usual number.

Zoological Garden.—The animals classed as "native" are bear, wildcat, foxes, rabbits, etc. Miscellaneous consist of the above, also monkeys.

Nine companies own the animals and one company hires them.

Theater.—Of the 43 companies replying, that have theaters, 26 have open; 17 closed and one convertible. The stages vary in size, and with one exception (which is 150 feet deep and 200 feet wide, their sizes range from 15 to 40 feet deep and from 20 feet to 80 feet wide), and from 10 to 40 feet high. The average size appears to be about 30 feet in depth, 40 feet in width and 20 feet in height.

The seating capacity varies from 300 to 3,000, with an average of about 1,200.

About 75 per cent of the theaters have reserved seats, the proportion of reserved seats being about 45 per cent.

The price of reserved seats vary from 5 to 50 cents, the usual price being 25 cents; that of other seats from 5 to 35 cents, the usual price being 10 cents. In most cases where the reserved seats are but 5 or 10 cents, the other seats are free.

Bands.—The answers received from the 43 companies replying to the question: "How often do you employ bands?" are as follows:

Monthly	1 companies
Weekly	8 "
Sunday and Holidays	22 "
Three times per week	5 "
Two times per week	2 "
Daily	3 "
Special occasions	3 "

The number of pieces in the bands vary from seven to forty, the average being about 20.

Orchestra.—Twenty-seven companies reply as employing orchestras; the number of pieces are from two to fifteen, the usual number being about six.

General Questions.—The methods used to get undesirable people out of the park are by aid of police or special park officers. The latter are usually appointed as deputies.

The method used to keep account of attendance at the parks is usually by counting tickets. Other methods are by conductors' tallies or turnstiles.

Nine companies reply as charging admission to the park, of which eight charge 10 cents and one charges 5 cents.

Thirty-five companies reply as leasing parks, of which 14 lease them on flat rental basis; 9 on percentage basis; and 14 on rental and percentage both.

The only contributions obtained from concessionaries for running extra attractions, etc., were from six, of which two are stated as limited, two as 20 per cent of expenses, one as 25 per cent of expenses and one as 50 per cent of expenses. This is in cases where privileges are leased.

Investment in Park.—The financial statement requested under this heading is given by but few companies. Several companies are unable to give this statement as no record is kept of these accounts.

The distance of the park from center of population served varies from 1 mile to 10 miles, and in one instance 18 miles. The usual distance, however, is from 2½ to 4 miles.

One 5-cent fare is the charge generally made for any distance within four miles. Over four miles the rate averages about one 5-cent fare for every three miles.

Company No. 58 gives this detail as follows:

	Amount paid.	Season, number of weeks.
Theater, including all theater expenses..	$6,000 00	15
Band	900 00	....
Launch and Boats	400 00	....
Dance Hall	150 00	....
Other Expenses	2,050 00	....

Receipts per person entering Park for entire season	.056
Operating expenses per person entering park for entire season	.063

Company No. 59 gives detail as follows:

	Amount paid per week.	Season.	Season, number of weeks.
Theater, including all theater expenses	600	6,000	10
Band	45	450	10

With these two exceptions no other company has given any detail or information of cost of amusements that can be considered. A few companies have given some figures, but same are useless without some explanation, and this is not given.

Very few companies have given the additional car-miles and car hours account of park business. Those given vary from 200 to 50,000, and from 40 to 6,000 respectively; but as some of the companies giving this information have estimated it, and not replied to some of the other questions relative to the park business, which should necessarily be given with the above, there is no chance for comparison or basis upon which to give a fair or intelligent statement on the same.

ADDRESS OF PRESIDENT RHOADES BEFORE THE AMERICAN ASSOCIATION.

This is probably the first occasion upon which a representative of the Claim Agents' association has had an opportunity to appear before you, and on behalf of our association I beg to thank your executive officers for the privilege.

As operators of the various railway systems, I presume you find the claim department less interesting than any, but without doubt the majority of managers realize by this time that the expense of accidents is as inevitable as the replacing of wheels and the purchase of coal. It is true, that by careful management and the exercise of conservative judgment, the account may be to some extent regulated; but it is an operating expense which increases with the passing of each year. Fifteen years ago the larger companies were paying approximately 1 per cent of the gross receipts on this account and practically keeping even with the business. Today the same companies are paying from 5 per cent to 12 per cent of the gross receipts.

To wrestle with this problem and improve the situation is one of the prime objects in the organization and maintenance of the Claim Agents' association. We are about to enter upon the third year of our existence and are just now closing a successful convention which has proved instructive and which has resulted in great good by the interchange of ideas and the discussion of ways and means. Heretofore our association has not had the proceedings of the convention reported; but arrangements have now been made to print in full the discussions and papers, so that any company not represented or which has not a regularly organized claim department, may have the benefit of the experience of others.

Through the liberality of your executive committee, we have been enabled to maintain a secretary and any information referring to the accident branch of the association, may be obtained by addressing him. He in turn requests information from active claim agents and detailed replies are promptly sent to the company seeking data. Considerable time has been spent and expense incurred in the prevention and detection of fraudulent claims; but this class of claims does not cause any great outlay. The really great expenditure of money is for exaggerated injuries; and this condition, due to cupidity of claimants, regardless of truth and justice, we have been unable to meet in any satisfactory way. Legislation in the various states making barratry and maintenance an indictible offense, and prescribing therefor a severe punishment, would seem to be a step in the right direction. When you determine to suppress the unprincipled attorney and physician, you will find the claims presented to be comparatively honest, and the longer this procedure is delayed, the greater the number who will be taught to feed on your revenues. Of course, if the ingenuity of your engineers and inventors can so construct cars that they will not break down or blow up, the cost of accidents will be lessened; but as long as human agencies are employed to operate electric cars, we will have to reckon with the claim agent and the loss account.

The companies represented by your association have paid during the past twelve months approximately $10,000,000 in the settlement of accident claims and the expense attendant thereto. They have a liability of at least one-half of this amount arising during the same period. You will therefore observe that the claim business is on the increase and the problem deserves the best thought and the most earnest consideration.

Perhaps if your car builders knew that you are spending annually $4,000,000 for accidents caused by people boarding and leaving cars, some practical device might be used to lessen this class of accidents. You are spending 1¼ millions per year because fuses blow out; and 2½ millions per year because your motormen continue to run one car into another. It may be of interest to engineers and mechanics to learn that such accidents as hand straps breaking, defective seats, grease on the car floor, motors burning out, etc., cost your respective companies about three fourths of a million dollars every twelve months and injure about 5000 people. Of course these figures are approximate and based on averages.

There is one more thought which I wish to impress as forcibly as possible upon those whose province it is to determine which cases to appeal. Preserve the favorable law rather than take chances of having new and adverse decisions subversive of the present law of your respective states. The cost of any judgment is insignificant compared with the principle involved; and with accident litigation increasing at the rate it is bound to, you will find that each error in this respect will cost untold sums in the future and aid unprincipled persons to further open the treasury door.

THE USE OF CURVES IN STATISTICS.

BY A. STUART PRATT, GENERAL AUDITOR AND TREASURER STONE AND WEBSTER, BOSTON, MASS.

The familiar notched stick of the savage is, perhaps, one of the earliest instances of the recording of statistics. As society became more highly organized, figures and numbers were invented and finally developed to such a state of perfection that by their use the most intricate data could be compiled and recorded.

The accountant, the statistician, the manager, the financier of today finds the constant use of statistics necessary to the proper understanding of the intricacies of his business. He compiles his data by the use of figures and his operations for a month, a short series of months or a year are well shown by this method. As the period of his operations increases, however, he finds that the figures become confused in his mind. He cannot fully grasp the relation which they bear to each other, and he seeks some method of simplifying them in order that he may have a complete grasp of the complicated data before him. For this purpose he makes use of percentages, of ratios and of averages. These methods are all of great value and to many minds furnish all the information that is desired.

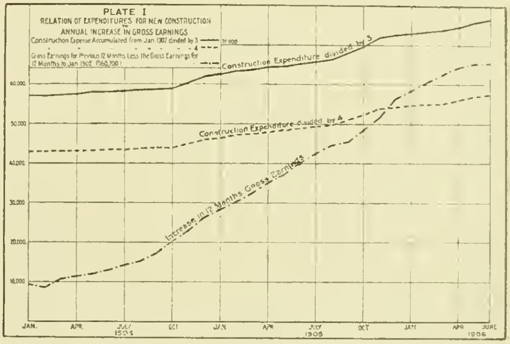


Plate 1.

To another class of mind, however, something further is desirable. The man needs a picture of what has happened. Instead of telling him that you have spent $100,000 in an addition to your power station, he understands the situation much better if you can give him a photograph of the power station as it was before the addition and as it is now. To carry out this idea in practice the graphic method of compiling statistics has been, in late years, very largely employed. This method is well illustrated in the Statistical Atlas of the Twelfth Census of the United States. This contains a large number of maps showing, by varying shades of color, the density of population, various products and other matter which can be advantageously shown in this form.

The block system is also largely used, by which lines of varying lengths represent the relation of the totals under comparison.

Methods like the foregoing are valuable in the handling of data for completed periods. Where, however, data come to hand in progressive periods, and it is desired to keep the latest information obtained before one in graphic form, a method more elastic must be adopted. It has been found that the curve is admirably adapted for this purpose.

The object of this talk is to give a general outline of the method of preparing diagrams, with a few instances, showing some of the more important applications. Anyone interested in pursuing the matter further will readily devise curves to show almost any data which are under consideration, and, by experimenting a little, can find out if the curves thus drawn have any real value for his purpose. I assume, however, that in the rush and hurry of modern business, a few simple curves, drawn on the natural scale, are sufficient for the average office. I shall, therefore, avoid consideration of the logarithmic curves, which are curves of ratios rather than of actual quantities, very useful in their appropriate place; neither shall I consider the weighting of curves by the insertion of estimates for unknown quantities. These and other matters of like nature, are within the province of the statistician, pure and simple, and are hardly appropriate for the general use of the man in business.

At the risk of repeating what so many of you know, I will describe shortly the method of plotting curves.

Establish a base line at the bottom of the sheet, marking, at equal intervals and in order, the various dates covering the period under consideration. At right angles to this line erect a perpendicular, starting from the point representing the beginning of the period. This should be divided into appropriate parts, representing equal increases in dollars. The paper is then ruled in rectangles.

In the plates which are before you the lines are drawn for every three months. The data are, however, figured monthly and in practice the ruling would be monthly also, the intermediate lines being omitted here simply in the hope of adding clearness to the illustration.

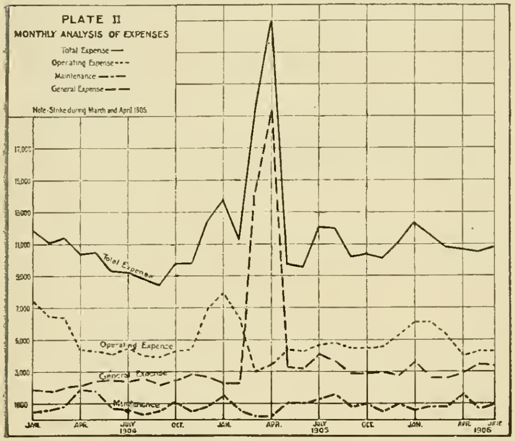


Plate 2.

With your data before you in figures, you are now ready to plot your curve by making a pencil dot for each total of dollars in your series over the appropriate date and to the right of the proper number of dollars. You have now recorded your facts and you connect them with a broken or curved line for the purpose of being able to take in at a glance the relation which each item bears to the others in the series.

If a study of the plates which are presented herewith does not show to one familiar with the business under discussion, the facts which they are intended to convey, they have failed in their mission. Nevertheless, perhaps a short explanation of each will be appropriate. All are taken from the real operation of companies under Stone & Webster's management.

Plate I represents the relation of expenditures for new construction to the annual increase in gross earnings. Such a sheet tends to show whether or not good business judgment has been used in extending a company's plant.

The three lines on Plate I started at zero in January, 1902, and at the first date which is shown, January, 1904, the gross had increased but $10,000, while some $170,000 had been expended on the plant. The increase in twelve months' gross earnings, as plotted for the next two years and a half, shows practically steady gains, with but little change in acceleration.

You will note that each curve representing construction expenditure is obtained by dividing the expenditure in the one case by three, in the other by four. This is done on the theory that construction, to be warranted, should finally produce an annual increase in gross earnings to an amount equal to one-third or one-fourth of the expenditure involved, the exact figures in each locality to be determined by a comprehensive judgment of local conditions, being dependent largely on the ratio of operating expenses to gross earnings. By dividing the construction expenditure we bring down the curves of construction so that they are easily comparable with the increase in gross.

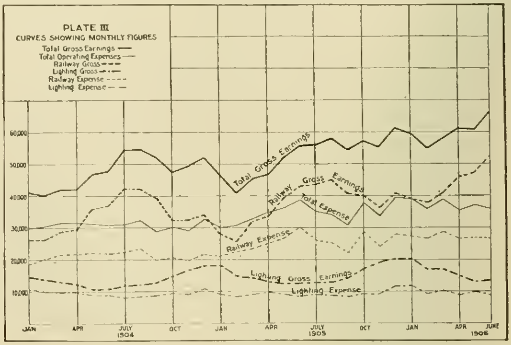


Plate 3.

In the case before us, you can see that it took from January, 1902, to November, 1905, for the increase in gross to equal one-fourth the construction expenditure, and it has not yet reached the line representing one-third of construction expenditure.

It is perhaps needless to say that in using such a set of curves as this, one may be entirely misled unless he has a full knowledge of the situation. For instance, the increase in gross earnings, which has been very marked, would, perhaps, have occurred in very great part had no construction been done on the property.

Furthermore, construction expenditures to large amounts are often forced upon a public service corporation when everyone connected with the company recognize that no increase in gross earnings can possibly result. Of course curves can be weighted to eliminate such matters, but it must be done with great care, and it is doubtful if much additional information would be derived from the result.

Plate II is the monthly analysis of expenses. It is shown here mainly to demonstrate the abnormal curve which is developed at times when unusual conditions prevail.

Total expense rose during a strike to ruinous heights and the various elements which go to make this up, as plotted below, show that general expense was responsible for the entire increase, while operating expense and maintenance were both abnormally low.

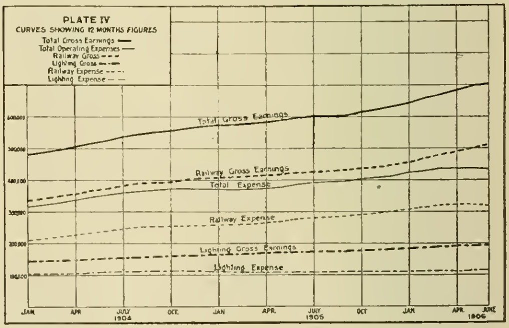


Plate 4.

Plate III presents curves showing monthly figures covering the operations of a company doing both a railway and a lighting business. The curve representing total gross earnings is obtained by a combination of the curves for railway gross and lighting gross.

Here it will be seen that the increase in the summer riding of the railway department is partially offset by low earnings in the lighting department, while in January the opposite state of affairs is shown, the large increase in lighting earnings offsetting in part the decrease in railway earnins. Expenses of the two departments bear a similar relation to total expenses.

This sheet should be of value to the manager who is familiar with the details of operation and who should know the reason for the location of every point that is plotted.

Plate IV represents the same data, taken from the same company, covering the same period, except that the curve is smoothed by plotting each month the point which represents the previous twelve months' figures. This results in eliminating violent monthly fluctuations due to the season or perhaps to the removal of snow and ice or to large maintenance charges and shows the general trend of the operations of the company.

These are much more valuable data than the other for the board of directors or the stockholders, as they have but little interest in monthly fluctuations, but are vitally concerned in the general situation.

Plate V is designed to show the application of gross earnings, principally with a view of finding out what per cent is available for common stock dividends.

The distance from the gross earnings curve to the base line represents the entire gross earnings for twelve months on successive dates. Operating expenses are then cut off from this, leaving a line representing net earnings. Then interest charges are cut, leaving a curve which we will call net profit. We then cut off a slice for sinking fund and another slice for preferred dividends, and finally arrive at a surplus applicable to depreciation and common stock dividends, the percentage for the stock being shown on the right-hand side.

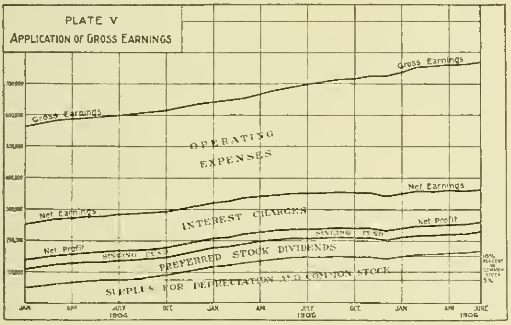


Plate 5.

While on the sheet before us, in June, 1906, there would appear to be about 10 per cent applicable to the common stock dividends, it is, nevertheless, evident that the melon cannot be cut at this point, as no provision has yet been made for depreciation. This was left out, advisedly, as being a subject not appropriate to the matter in hand.

We recognize fully that the sinking fund, which is deducted, is not an altogether appropriate deduction from gross earnings, and goes but part way in providing for depreciation.

Curves like those on Plate V tell the operating man nothing new, but are oftentimes desirable to give a comprehensive view, covering a series of years, to stockholders, or others financially interested in the company.

Before bringing to a close this elementary treatment of the subject, the fact should be emphasized that curves, like figures, are very misleading unless the person who uses them is thoroughly familiar with the method by which they are compiled. Bearing this in mind, the use of the one will tend to bring to light points hidden by the use of the other alone, and the man who employs both will find that the labor involved in the preparation of the data is well repaid by the increase in his knowledge of the situation.

A successful demonstration of rail welding by the thermit process was given by the Goldschmidt Thermit company yesterday. The demonstration was witnessed by a large number of railway men.

REPORT OF THE COMMITTEE ON INSURANCE.

H. T. Davies, Chairman; T. C. Pennington, R. B. Stearns

At your meeting last year, figures were presented to you, tending to show that the premiums charged for the insurance of street railway properties against loss or damage by fire were excessive, that the losses by fire on such properties in ten years had been about one-third of the premiums paid, and that the traction companies of the country could better afford to carry their own risks than to insure their properties at the rates charged by the insurance companies. As a result of the publication of these figures, and of work done in Cleveland, with the approval of your committee on "Insurance" policies written within the year have been written at lower rates than ever before on the properties of those companies that have demanded a reduction. True, the insurance companies, through their inspections and rating bureaus, have in most cases required of the insured improvements that would somewhat lessen the hazard of fire; but a very slight betterment has been sufficient to induce a very material decrease in premium. There is danger now that the stock insurance companies will write policies at less than the probable losses and the cost of doing the business. This would be expensive and unwise, both for the insurers and for the insured, because it would mean, primarily, a loss to the insurers, and, ultimately, excessive to the insured.

There has been practically no competition among the insurance companies for street railway business. The Factory Mutual companies compete with the stock insurance companies for insurance on "protected" properties, i. e., on properties equipped throughout with sprinkling devices that operate automatically upon the occurence of a fire, or buildings so constructed as to be practically fire-proof. But these companies have been unwilling, until within about a year, to carry insurance, even on "protected" buildings of traction companies, their objection to writing insurance on such buildings being that, as most fires in car-houses occur in the cars stored in them, and originate below the roofs of the cars, such a fire would spread from car to car beneath the roofs, and cause a heavy loss before the heat from the fire could reach the ceiling of the house and open the automatic sprinklers, and, further, that, as car-houses are usually open at both ends, and, as, in many car-house fires, there has been a draft or suction of air through the buildings, heat from the fire, instead of opening the sprinklers immediately over the fire, would be carried to a distant part of the building and open sprinklers that would not play upon the fire, and that might exhaust the water supply before the sprinklers over the burning cars were opened, or so reduce the water pressure that the supply from the sprinklers in the immediate vicinity of the blaze would be insufficient to extinguish the fire. This objection was removed by a suggestion of Mr. Henry N. Staats, an insurance expert of long experience, who has been your committees disinterested adviser, that, in addition to the ordinary ceiling sprinklers, a line of sprinklers be placed in each aisle of the car-house, so that, in case of a fire in a car, the heat therefrom would open sprinklers on the side lines, and cause streams or sprays of water to be turned into the car through its transoms and windows. Experiments to test the efficiency of such an equipment were made at Cleveland, O., and at Newark, N. J., in the presence and under the direction of the leading insurance engineers of the country, both stock and mutual. The tests were made under the most severe conditions, and in each test the fire was confined by the sprinklers to a single car. After these tests, the factory mutual companies said they would write car-houses and their contents so protected, and the stock insurance companies made rates to meet the rates of the mutuals, which carry insurance at cost. To prevent a combination of rates between the factory mutual and the stock companies on what are called "protected properties," mutual insurance companies have been organized by street and interurban railway companies in Ohio, whose purpose is to insure only those preferred risks of traction and lighting companies that the factory mutual companies are willing to carry.

But fire-proof and "protected" buildings are a small part of the properties of the street and interurban railway companies of the country, and the only companies now writing insurance on properties not fire-proof and not equipped with sprinklers, are the "old-line" or stock insurance companies. There is no such competition for insurance upon these properties as there is for insurance upon "protected" properties. Therefore, in order that all traction companies—those that have protected properties and those that have not—may have the benefit of reasonable rates for fire insurance, a number of street and interurban railway companies in the East and the Middle West are perfecting the organization of a stock insurance company with mutual features, to write insurance upon all classes of traction and lighting company properties. This company is to have a paid-in capital stock and surplus of one million dollars in cash. The rates will probably be the same as those charged by the "old-line" companies, because this company and the traction mutual companies, before mentioned, will have their own inspectors, who, confining their attention to traction and lighting properties, will become experts in their line, and will make the insurance rates for their members. All the premium receipts of these companies in excess of fire losses, expenses and 6 per cent on the capital and surplus of the stock company, are to be returned to the insured. This means safe, sane and scientific insurance at actual cost.

The principle is not new. Some of the factory mutual insurance companies, organized by manufacturers to insure their own properties, have been in existence for 70 years. They have always carried insurance at low rates. They have selected their risks. They have insisted upon care upon the part of the insured in the construction and protection of properties. None of them has ever failed. None of them has ever made an assessment upon its members. Acting upon the same principle, the United States Steel Corporation, having large properties in many places, and not being subject to a total loss of its assets by any one fire carries its own insurance. So does the Pennsylvania Railroad company. So do other large railroad companies. The Philadelphia Rapid Transit Company is large enough to carry its own insurance. It has, for years, set aside sums for this purpose, until its insurance fund amounts to a million dollars or more. The interest on this accumulation is probably sufficient to keep it up to this amount. No single loss can exhaust this fund, for the company has not a million dollars' worth of property in any one location, unless it be at its power-plants, which are substantially fire-proof, or, at least, certainly not subject to a total loss by fire.

Not many traction companies are able to do what the Philadelphia company has done. Two or more of them may unite, however, to carry their own insurance. And this is exactly what some of us are trying to do, for the benefit of all of us. The plan of organization and work of these street railway insurance companies has been approved and endorsed by your insurance committee. They are to be owned, controlled, officered and operated by the street and interurban railway companies of the country. They are your companies, and are to be conducted by you for your own benefit. Many of you are familiar with them, for plans and specifications have been prepared by them for the protection of 444 separate properties of 69 street and interurban railway companies.

The "old-line" insurance companies have sustained very heavy losses within the past year or two in San Francisco and elsewhere. In consequence of their unusual losses, some of them may fail. A general increase in rates is inevitable. The work herein outlined has, however, prevented an increase in the average rate on street railway properties. A continuation of the work will keep rates down. Better still, a continuation of the work and your support of the new companies will bring the ratio to actual cost. They ought not to be lower than cost. If the traction and lighting companies will unite to insure their own property, and will confine their insurance business to their own properties, and conduct it with intelligence, with accurate knowledge as to losses and hazards, they can keep the cost of insurance where it ought to be. If they do not, and continue to place their insurance with companies that insure all kinds of property, and that base their rates on the hazard of particular localities, rather than of particular classes of property, then they must continue to pay those companies rates high enough to cover, not only fire losses on their own properties, but losses upon more hazardous properties, commissions to agents, subagents and solicitors, and profits to the insurers.

Are car-houses and their contents so extraordinarily hazardous as to make it unsafe for street railway companies to organize for the purpose of carrying their own insurance? Are they, as has commonly been supposed, more hazardous than other properties? In the first place, while there have been some large losses on car-houses and their contents in the past ten or twelve years, we know that those losses have not nearly equalled the amount charged for insurance. Secondly, they are not as a rule subject to what is called "conflagration hazard." A "conflagration hazard" is the hazard or risk of a property being entirely destroyed by reason of being in a compactly built section that may be wiped out by a large fire. Car-houses are usually in the outskirts of cities, far removed from the congested business districts. Thirdly, while the property of a street railway company may be worth millions of dollars, the property is not, like that of a manufacturing company, situated in a single locality, but is scattered in as many places as there are lines or routes of railway operated, and the largest loss that the company can sustain in any one fire is the value of the property that it has in one location. In writing insurance, each property is to be treated as a unit, just as it would be if each car-house were owned by a separate company. This will make it safe for the street railway companies' insurance companies to carry large lines of insurance upon the property of each of their members.

Your committee has considered the advisability of protecting car-yards by the installation of open-head sprinklers between tracks, and by the erection of fire-walls, but no actual fire test to determine the efficiency of this method of protection has been made.

The subject of the construction of car-storage houses and the protection of their contents has been considered and discussed by the National Fire Protection Association at its last two annual meetings, and we call attention, without quoting from it, to a very carefuly prepared and able report made to that body this year by its committee on car-houses, which was published in full in the Street Railway Journal and Street Railway Review. The 1905 report of that committee contained an interesting and detailed description, with photographs, of the car-burning experiments in Cleveland.

But greater than the duty of railway managers to their stockholders and bondholders to insure their properties against loss by fire is their duty, not alone to their stockholders and bondholders, but to the general public, to have no fire, and to keep the cars running. The loss of business consequent upon a car-house fire is likely to be larger than the value of the property burned. Against this loss there is no insurance. More important, then, than insurance against loss by fire is the protection of traction properties from fire. No plan of car-house construction that will prevent a fire, no practical method of protecting the rolling stock of street railway companies from destruction or damage by fire, can be regarded as extravagant or improvident. More importance should be attached to providing protection against damage by fire than to providing a fund for replacing property destroyed by fire. Both should receive attention from your Insurance Committee, and from the insurance department of every street railway company.

Some two years ago, Mr. Edward Atkinson, since deceased, who was probably the greatest expert on fire insurance in the United States, and a statistician of world-wide reputation, was consulted on the subject of the advisability of street railway companies forming insurance organizations for mutual protection against loss by fire. Following that conference, he wrote an opinion on the subject, from which we quote:

"Having been asked to express my judgment on the expediency of organizing a system of mutual insurance among electric traction companies covering power-houses, car-barns and other structures necessary to the work, I beg to say that the prime motive of the factory mutual system of insurance is to prevent loss by fire, coupled with a contract of indemnity for payment in money of the unavoidable losses which can neither be prevented by the owners or managers of the works nor by the experts employed by the underwriters in forestalling the causes of fires. Nearly every fire in factories, and correspondingly nearly every considerable loss by fire in the class of buildings connected with electric traction, is due either to faulty construction, bad occupancy or lack of requisite apparatus for extinguishing the fire in its earliest stage. It follows that if the managers of electric traction companies organize or join any mutual insurance company for the purpose of getting lower rates of premium without qualifying their works in every possible manner so as to make them fit to be insured at low rates, they ought not to be admitted to a mutual company that is under judicious management. If, on the other hand, they will make the officers of the mutual company their agents to point out to them existing causes of danger and remedies, and to devise safe and proper methods of construction and of conducting their work, they will gain the same very great benefit which has been gained by the members of the factory mutual system."

In the opinion of your committee, all the members of the American Street and Interurban Railway Association may be profitably consolidated into one company, to the extent, at least, of the insurance of their properties against destruction or damage by fire.

The Clark Automatic Street Car Fender Company, of Decatur, Ill., is exhibiting its protruding and non-protruding fenders in Building No. 6. Mr. Ira P. Clark, who is in charge of the exhibit arrived here yesterday and as part of his exhibit had not yet been delivered at the hall he was compelled to set up the frame of the fender without the material that aids in making a satisfactory display. The Clark fender has been in use for a number of years and has a record for preventing people from being injured by cars equipped by it.

ACCOUNTANTS' QUESTION BOX.

1. When periodical payments are made for the purpose of retiring bonds, and a sinking fund is thus created, to be closed at intervals by the redemption of bonds, this action reducing fixed charges, would you show the expenditure in annual statements as a deduction from income, or merely enter it in the accounts as a reduction of liabilities?

Of the thirteen companies than answer this question, five consider that the charge should be shown as a deduction of income and three that it should be shown merely as a deduction of liabilities in the annual report. Five of the answers are not definite. We quote three answer which seem to give the best explanation of the proper policy to pursue.

Worcester Consolidated Street Railway Company.—The payments to sinking fund should be shown in the annual statement as a deduction from income, otherwise a casual observer would be compelled to compare the reports for two years in order to get the desired information.

Chicago Union Traction Company.—If the payments to sinking fund are required by the bonds or mortgages, or there is an agreement with the purchasers that a specified amount of bonds are to be retired annually; the amount becomes a fixed charge, and should be included in "Deductions from Income" each month, showing its proportion of the annual charge. When bonds are voluntarily purchased the "Income Account" is not affected except by the reduction of future interest charges.

Boston Elevated Railway Company.—When transfer is made to the sinking fund it should show as a deduction from income, and when the bonds are redeemed it should show as a reduction of liabilities.

2. Where bonds set aside for future improvements are taken down from year to year and sold at a discount from face value, how should the amount of discount be charged off. If the amount of discount appears for a time on balance statement, under what group of accounts does it belong according to balance sheet form on page 60, Report of 1905?

Thirteen companies submit answers; six prefer to make the charge to operating expenses or to profit and loss and seven consider that discount on bonds should be a charge against construction or equipment. The general opinion is that in the balance sheet discount on bonds belongs in account N, as part of construction and equipment. As an example of difference of opinion obtaining may be cited the Montreal Street Railway Company, which recommends that discount on bonds be shown in the balance sheet as current assets, miscellaneous, and the American Railways Company, which considers accrued liabilities, miscellaneous, as the proper place.

3. What accounting methods should be followed where equipment (steam, electric, rolling stock, and overhead) in fair working condition is replaced with new outfit, to make a lately acquired division uniform in equipment and practice with the rest of the road?

Fourteen companies submit answers. One considers that the charge should go to operating expenses, one that it should go to capital accounts, one that the difference between the cost new and the scrap value should go to capital accounts, and ten prefer to adopt the plan of charging to capital account the difference between the cost of the new equipment and the cost of the old equipment, were it replaced new at the present time. One answer is to the effect that before deciding it is necessary to know whether the reconstruction is to be done with new capital.

4. A—What has been the result from a reduction of fares from a five-cent cash fare to four and one-sixth cents by use of ticket? B—What per cent of tickets are lost? C—How much of passenger receipts come in through ticket? D—Does the increase in riding offset the decrease in fare, that is to say, is the natural increase maintained?

Of the two companies answering question A, both say that traffic is increased, in one instance being practically doubled the first year. Two answer question B, one giving the figure at one-half of one per cent and the other at less than one per cent. The answer to question C are 90, 83, 4, 50, 6 per cent, respectively; the answers to this question indicate widely varying conditions. To question D three answer "Yes," and one "Possibly."

5. In case of two registers in each car, where all fares are registered, free transfers issued, certain forms of tickets sold by conductors, and others by agents covering more than one zone, under a system of dividing lines into zones of five-cent fare, what distinction of fares should be made in registering?

Of the six companies submitting answers one prefers to register cash and all transportation having a cash value on one register and all forms of transportation having no cash value on the other register; two prefer to register cash only on one register and all tickets, etc., on the other; one company uses the Ohmer register for all classes of fare and does not distinguish between cash and tickets; two consider that it makes no difference what classification between registers is adopted.

6. Where all tickets are registered on one, and cash fares only on the other register, what possibilities are there for the conductors to substitute a free ticket or transfer for one of value?

Nine companies answer the question; eight consider that the possibilities are great and two specify that it depends altogether upon the extent of the transfer privilege and the number of transfers issued.

7. To what extent should conductor's returns be analyzed where all fares are registered and free transfers issued?

Eleven companies sumbit answers, three of which are quoted.

International Railway Company, Buffalo, N. Y.—We verify all computations on conductor's reports and check same against register readings. We do not think any further analysis would be of much value.

Chicago Union Traction Company.—Enough to know that the percentage of transfers issued to cash fares received is fairly uniform.

Indiana Union Traction Company.—To the extent that combined with inspectors' reports, irregularities may readily be detected.

It is considered that to go further than this is a question to be decided by each company for itself, having in view the cost of obtaining the information and its value in each particular instance.

8. What is the best method for the accounting department to pursue to discover discrepancies in the conductor's report of fare collections?

Eight companies answer the question. It is considered that the accounting department can do very little beyond verifying beyond computations and checking against the register readings, it being necessary to rely upon the secret service to detect discrepancies between the facts and the record as made on the register and report. Two suggestions follow:

The Columbus Railway & Light Company.—Keep daily record of each conductor's returns, having a column for each class of fare. At the end of the month, foot each account and then fill out the percentage which each class of fares bears to total passengers carried. Compare this finding, one conductor's account with another, and you will soon be able to detect where the weakness, if any, exists.

Indiana Union Traction Company.—In interurban service this may be accomplished by using tickets as much as possible. When mileage coupons are presented for passage, conductor should write on back of strip lifted, points between which passenger traveled. If card passes are used, passengers should sign identification slip showing pass number as well as points between which pass was used. Duplex receipts should be punched by conductor for cash fare collections. The coupon turned in to auditor will show amount of fare collected and zone covered by same.

With this system provided inspector may be put on, from time to time, and an accurate comparison may be made of their reports of passengers "on" and "off" at each station, with the tickets, coupons, pass identification slips and cash fare receipts audit coupons in the conductor's trip envelope.

9. Is the information obtained from a thorough and exhaustive examination and comparison of conductor's reports of sufficient importance to warrant the expense, and should it be made daily?

Nine companies answer the question. The general opinion is that minute examination of all details of tickets and transfers and making comparison with the reports should be done only at irregular intervals. A daily check is believed to be too expensive.

10. Should scrap material accumulate in the storeroom or in the departments?

Of fourteen companies answering, 13 specify the storeroom and one the departments.

11. Should the wages paid to employes injured while in service be charged against the department where the accident occurred or be accounted for through the claim department?

Of 13 companies answering only one recommends charging against the department where the action had occurred, while 12 specify that wages so paid should go through the claim department, on the theory that it is one way of settling a damage claim. One company suggests a distinction between claims that can be enforced legally, which should go through the claim department, and wages paid as a donation, which should be charged to account 32.

12. Should the cost of repairs to cars and equipment occasioned by accident be included in the regular maintenance account or accounted for through the claim department?

Of the 13 answers submittted 12 specify the maintenance account; one says theoretically, claim department, but practically, maintenance account.

13. Is the statistical information obtained from the use of the passenger unit of such value and interest as to justify its continuance.

Two companies answering do not consider the passenger unit of any importance, while nine report that the information is interesting and often of value and that it is easy to get.

14. Is not the car hour unit more valuable as a basis for determining results in connection with earnings and expenses than the unit of car mileage?

Of the fourteen companies which reply all consider that both units are valuable. The American Railways Company says: "For most cases, 'Yes,' but in determining the life of wheels, trolley whtels, gears, pinions, motors, etc., the car-mileage basis is essential."

15. What basic figure is best in determining the rate for chartered cars, earnings per hour or mile?

With the 14 companies answering the question the general preference is for the hour basis, although two prefer the car-mile basis and two suggest a combination, that is, a rate based on the mileage to which is added a flat charge per hour for waiting time.

16. Should the receipts from chartered cars be proportioned over the lines operated, or treated as an independent passenger earning?

Fifteen companies answer the question; 12 consider that the receipts from chartered cars should be treated as independent passenger earnings and three that they should be pro rated over the lines earning them.

17. What is the best system of numbering the operating expense accounts for the electric light department where a company operating both railway and electric light and follow the railway standard classification. If the electric light standard classification is followed how is it modified to make it correspond with the railway?

The Columbus Railway & Light Company.—If the railway account starts off with "1," make the starting account of lighting "201," and so on.

New Orleans Railway & Light Company.—Our electric light expense accounts are numbered from 51 to 100, and we have found that very convenient.

18. What sub-accounts of standard operating expense accounts do you use?

New Orleans Railway & Light Company.—Account "A" to every operating account and which represents "Labor."

Montreal Street Railway Company.—We issue a monthly statement "Details of Operating Expenses" on which we show about 150 sub-accounts; the standard transportation and maintenance accounts are all sub-divided as are also office expense, stationery and printing, miscellaneous expense and stable expense of our general expense accounts.

Indianapolis & Cincinnati Traction Company.—In the construction section: K1, cars, express; K2, cars, work; L1, electrical equipment of cars, express; L2, electrical equipment of cars, work.

In the operating section: 2A, telephone lines; 5A, transformer stations; 6A, cars, express; 6B, cars, work; 7A, electrical equipment of cars, express; 7B, electrical equipment of cars, work; 17A, wages of conductors, express; 17B, wages of conductors, work; 18A, wages of motormen, express; 18B, wages of motormen, work; 22B, miscellaneous car service, express; 24½, station expense, passenger and express; 26A, salaries to agents and station clerks; 33A, damages, express; 34A, legal expense in connection with damages, express; 34B, surgical expense in connection with damages, all.

International Railway Company, Buffalo, N. Y.—All maintenance accounts are sub-divided as to labor and material. We also sub-divide as follows:

Account 1.—A, repairs to asphalt pavement; B, repairs to stone pavement; C, repairs to brick pavement; D, repairs to macadam pavement; E, repairs to bridges pavement; F, reconstruction of track account city repaving.

Account 5.—B, maintenance of storage batteries; C, maintenance of rotary converter plant.

Account 6.—A, axles; B, brake shoes; C, journal bearings; D, painting; E, car signs; F, wheels, cast; G, grinding; H, wheels, steel; I, turning; J, damaged cars; K, miscellaneous.

Account 7.—A, armatures; B, field coils; C, commutators; D, brushes; E, brush holders; F, armature bearings; G, motor axle bearings; H, miscellaneous; I, controllers; J, gears; K, pinions; L, trolley wheels.

Account 10.—A, storage battery wages; B, rotary converter plant wages.

Account 13.—A, rotary converter plant, lubricants.

Account 14.—A, miscellaneous supplies and expenses, batteries; B, miscellaneous supplies and expenses, rotary converter.

Account 20.—A, car cleaning, labor; B, car cleaning, material.

Account 21.—A, lubrication.

American Railways Company.—Sub-account to maintenance of electric line, telephones and signals.

To maintenance of electric plant, sub-station plant.

To lubricants and waste for power plant, lubricants and waste for sub-station plant.

To miscellaneous supplies and expenses power plant, miscellaneous supplies and expenses sub-station plant.

To advertising and attractions, park expense, theater expense.

Worcester Consolidated Street Railway Company.—The only sub-accounts used outside of standard schedule are the maintenance of air brake equipment.

Chicago Union Traction Company.—All accounts in which the pay-roll appears are subdivided into pay-roll and other charges.

Paving is kept as a subdivision of maintenance of track and roadway.

Providence & Danielson Railway Company.—We use sub-accounts for operation of freight car to distinguish from operation of passenger cars.

Indiana Union Traction Company.—Maintenance way and structures—No. 1A, maintenance and renewals of paving; IB, maintenance of track bonding, 2A, maintenance of telephone lines; 2B, maintenance of signals and signaling apparatus.

Maintenance of equipment—No. 5A, maintenance of electric plant, sub-stations; 6A, maintenance of freight cars; 7A, maintenance of electric equipment of freight cars.

Operation of power plant—Nos. 10A, wages, sub-stations; 13A, lubricants and waste for sub-stations; 14A, miscellaneous supplies and expenses of sub-stations.

Operation of cars.—Nos 16A, superintendent of transportation, freight; 17A, wages of conductors, freight; 18A, wages of motormen, freight; 19A, wages of other car servants employed, freight; 22A, miscellaneous car servants expense, freight; 24B, passenger station expense; 24C, freight station expense.

General expenses.—26A, salaries of agents and clerks, freight; 39, loss and damage, freight.

The Boston Elevated Railway Company submits a comprehensive scheme of sub-accounts, which are numbered to show the department of the road as well as the account to which the sub-account pertains. The last two figures indicate the sub-account and the first one or two figures the main account. The sub-accounts under accounts 1 and 25 are given herewith to illustrate the system:

MAINTENANCE, WAY AND STRUCTURES

Maintenance of Track and Roadway.

Gen'l A-C	Surface A-C	Elevated A-C	Subway Surface A-C	Subway Elevated A-C	
....	102	103	104	105	Superintendence and General Expense.
....	107	108	109	110	Laboring Repairing Track.
....	112	....	....	....	Labor, paving of track.
....	117	118	119	120	Maintenance of Timber and Ties and Tie Fastenings.
....	122	123	124	125	Maintenance of Rails and Fastenings.
....	127	128	129	130	Maintenance of Frogs, Switches and Guard Rails.
....	132	....	....	....	Paving Blocks.
....	137	....	139	140	Sand, Gravel and Cement for Track Repairs.
....	142	143	144	145	Maintenance of Track Tools and Equipment.
....	....	....	149	150	Maintenance of Subway Walls, Track Fences, Snow Sheds, Drains, Ventilating Apparatus, etc.
....	....	153	....	....	Maintenance of Structure and Foundations.
....	....	158	....	160	Maintenance of Third Rail Guards, Railings, Walk, Feeder Boxes, etc.
....	....	163	....	165	Maintenance of Signal and Interlocking Systems (Including Compressors).
....	167	....	....	....	Maintenance of Reservations.
....	172	173	174	175	Miscellaneous Expenses of Track and Roadway.

TRANSPORTATION.

Miscellaneous Car Service Expenses.

2501	....	....	....	....	Secret Inspection Expenses.
2506	....	....	....	....	Transfers and Tickets.
....	2512	2513	....	....	Wrecking Expenses.
....	2517	2518	....	....	Miscellaneous Supplies and Expenses of Car Houses.
....	2522	2523	....	....	Miscellaneous Car Service Expenses.

The Public Service Corporation of New Jersey subdivides accounts 1, 2, 6, 7, 8, anad 9, having from 3 to 14 divisions under each. Those for account 6 are as follows:

Sub-Accounts. Car bodies.
Painting and Varnishing.
Fenders.
Headlights, Gongs, Bells, Etc.
Fare Registers and Fixtures.
Window Glass.
Heaters and Fixtures.
Truck and Truck Parts.
Air Brakes and Fixtures.
Other Brakes and Fixtures.
Wheels and Axles.
Journals.
Brake Shoes.
Shifting Equipment.

19. In establishing a basis for calculating the per capita earnings of an interurban line, one of whose terminals is a large city, is it correct to consider the population of this city as tributary to your interurban line, either in whole or in part? If considered as partially tributary, what percentage of your total population do you include in your estimate of population served by your interurban line?

The Indianapolis & Cincinnati Traction Company.—We think the population of larger terminals should be considered. The percentage of population included should, however, vary with the class of poulation of the smaller towns served—for instance if agricultural, the business originating in city terminals will be smaller as compared with business originating in the same terminals where the towns served are manufacturing.

International Railway Company, Buffalo, N. Y.—We consider the total population when figuring the per capita earnings of suburban and interurban lines.

The Memphis Street Railway Company.—My opinion is, it would be proper to consider a part of the population of a large city terminal of an interurban system as tributary thereto. Have had no experience, but think the percentage would be largely governed by local conditions, and any estimate would necessarily depend very greatly on observation and experience.

Providence & Danielson Railway Company.—One of our terminals is a large city from which we obtain nearly all of our excursion, or summer riding. If every one of the population does not patronize us it is not our fault, but we reserve the right to claim them all as our people.

REPORT OF THE COMMITTEE ON SUBJECTS.

RICHARD MC CULLOCH, CHAIRMAN; E. G. CONNETTE.

Tht report of the committee on Subjects consists of the program which is presented to the association at this meeting, and any formal report is almost unnecessary.

In preparing the program it was assumed by your committee that there is a great deal of work to be done within a short period of time, and that this time should be utilized to the greatest advantage. Hence, it was desirable that all unnecessary or irrelevant reports ,resolutions, speeches, discussions, etc., should be eliminated as far as possible.

It was decided that the papers and discussions should be of a general and not of a local interest, that the papers should be on live subjects, short and pithy, requiring not more than fifteen minutes to read, and of a character to draw out discussion. Where it is possible to procure the papers sufficiently in advance of the meeting, the papers should be printed and distributed in advance. The writer should be requested to be at the meeting when his paper is called up, and should be given five minutes to abstract it, and a limited time allowed for discussion.

It was furthermore decided that the papers should be grouped, so that the topics of a similar nature might be discussed at the same session, so that anyone particularly interested in a certain subject could hear all the papers relating to that subject at one session. For instance, at this meeting we have an opening session, a report session, an interurban session, an employes' session, an executive session and a closing session.

The committee is extremely desirous that this meeting of the association be run on schedule time, papers and reports being called up and discussed exactly as outlined in the program. This has never been done at any previous meeting, and your committee is of the opinion that such a procedure would greatly increase the attendance and stimulate interest in the discussions.

The meetings of the main association and the subsidiary associations are so arranged that several meetings may be held at the same time. It is arranged, however, that no other meetings are held during the opening and closing sessions of the association, so that all may attend those meetings.

This committee on Subjects was appointed too late in the year to confer with the subsidiary organizations regarding their programs. If a new committee on subjects is appointed for next year, it is suggested that this committee confer with the proper representatives of the subsidiary organizations, so that there may be some degree of uniformity in the work of the various organizations, and so that none of the work undertaken may overlap.

As railway officials are busy men and have little time to devote to literary pursuits, it is always difficult to get writers for papers, and the program for the meetings should be arranged as far in advance as possible so as to allow plenty of time for the preparation of papers. The writers this year were not selected until the month of June, and the thanks of the association are due the gentlemen who, upon such short notice, furnished the papers for this meeting.

METHODS OF MANAGEMENT OF CLAIM DEPARTMENTS.

BY HENRY C. BRADLEY, ADJUSTER, CHICAGO UNION TRACTION COMPANY.

The basis or starting point naturally is the "accident," followed by a report of the train crew, upon the receipt of which the duty of the claim agent begins.

A record is made of the report, a brief account of the accident is given to an investigator, who is instructed to call upon the injured parties, ascertain what their injuries consist of, how serious they are and procure an affidavit of claim from all who will give it to him. If the case is a wreck or of unquestioned liability he is instructed to settle all cases possible up to a certain figure—say $50 or $100, if, in his judgment, the amounts are not excessive—otherwise to telephone the department and confer with the general claim agent for further instructions. In all cases where the injuries are of a serious nature a medical examination is requested and if it is consented to, it is made by the company's surgeon after a reasonable time has elapsed for the injuries to develop into a definite condition. After the report of the surgeon is in the hands of the claim agent he is in a position to determine what is a proper amount to offer in settlement and act accordingly.

This method, I find from inquiries, is about the same in all claim departments; is nothing new and applies only to cases where there is no defense for the company and where only a question of the amount to be paid is involved.

2. There is a class of claims that are a source of annoyance to all claim agents. They are termed by me as "blind or unreported claims," and all are more or less tainted with fraud. I have found them very difficult to handle. The company is entirely in the dark and must get evidence the best way it can, and more often than otherwise is unable to obtain any at all. My general method is to insist on an affidavit setting forth all the facts complained of by the claimant, his address and business, also the names and addresses of all witnesses, if possible, after which an invetigation is made—taking affidavits of all witnesses and inquiring into the character and standing of both claimant and witnesses. If they appear to be of reasonably fair standing and respectability, settlement is made if it can be effected on a fair and reasonable basis. If the investigation proves unsatisfactory payment is declined—the company depending on time and Providence to enable the company to find a defense, which does not always happen, and the company may be compelled to pay more than is asked in case of a verdict by a jury.

I never feel satisfied in my own mind, no matter how disposed of, that it was the best method to follow in dealing with this class of claims. If they are in the hands of a shrewd and dishonest attorney and suit is instituted, there is no way of determining what they will cost the company; so experience has taught me that if the demands are not exhorbitant a settlement for a small sum, even in doubtful cases, is money saved to the company. On the contrary, if a corporation follows such a method it is liable to establish the reputation of being an "easy mark" and invite other persons to attempt to hold it up, which keeps the claim agent in an uncertain frame of mind all the time as to what is the best method to pursue.

It is my opinion that all accidents should be carefully investigated and all facts relating thereto obtained as early as possible when fresh in the minds of witnesses and parties concerned therein. They should not be put aside, as is done by a great many claim agents, and after a lapse of time suit is brought and most of the facts and evidence are lost through inability of witnesses, etc., to recall to mind the facts and circumstances of the accident, which places the company at a disadvantage to defend itself through neglect of the claim agent.

Another important factor as an aid to the claim department is the manner and thoroughness of the train crews in getting the facts and circumstances of all accidents in obtaining as many eye witnesses as possible to same and making a full report of all the details; this, in a large percentage of the accidents, is sadly neglected.

Also if the operatives of the company faithfully performed their duties, as required by the rules, a very large percentage of the accidents daily occurring would be avoided. Unfortunately, however, the innate tendency of men to become careless and indifferent to their duties will not permit a railroad to attain a degree of perfection in operation and the accidents will continue to occur.

It is my experience that fairness and justice is the best policy to pursue; impress upon all the fact that the corporation you represent has a policy of according claimants, who deal with it directly, honestly and fairly, the same treatment; try to obtain the confidence of the claimant, which will make it easy to effect a settlement. You must remove from their mind the belief existing that all claim agents are sharks employed to defraud claimants out of their just rights.

The policy of railway corporations vary much as to the authority given claim agents. Some give their agents unlimited powers, in which case the agent is usually the general claim attorney.

Others require the claim agent to submit to and confer with the general manager or general claim attorney all claims that exceed a fixed amount, which amount varies from $50 to $1,000. As to which is the most efficient method to adopt I cannot say; they both have merit.

I believe it is wise to impose restrictions on claim agents, as it is better to have the opinion of more than one on matters involving a settlement, especially where the amount to be paid is large.

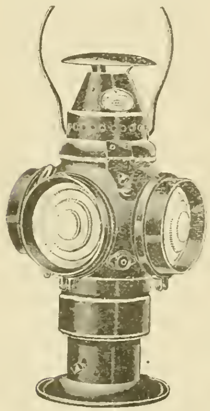
I have had experience under both systems and I have found them both to work fairly successfully. I think, however, where there is a general attorney, he is, by nature, of his own legal knowledge, better qualified to decide what is proper to do with a case, and a decision can be reached much quicker, which is a potent factor in a majority of cases.

Another important factor is the honesty and ability of the investigators. Much of the success of a claim agent depends on his assistants. He should have sufficient power and authority over them and not be hampered by restrictions in his management.

Experience has shown me plainly that diligence and efficiency can be better obtained through allowing the claim agent full scope in the management of the department as in his judgment is best for the interests of the corporation.

ADLAKE SIGNAL LAMPS.

An interesting feature of the Adams & Westlake Company's exhibit is the complete line of Adlake non-sweating ventilating signal lamps. The inception and introduction of this "non-sweating" system of ventilation in this company's lamps has been of great benefit, as it insures the lenses remaining clear and dry on their inner surfaces irrespective of weather conditions, thereby obtaining the full signaling strength of the lenses at all times. Where precipitation of moisture or what is commonly known as "sweating" takes place, the beads of water settle on the lenses and during cold weather turns into frost or ice which acts as a curtain, retarding much of the light and materially reducing the strength of the projected signal; this is entirely eliminated in the Adlake lamps. By obviating the sweating, corrosion of the lamp bodies is also prevented.



Adlake Lamp.

IN THE EXHIBITION HALLS

The Buckeye Transfer & Storage Company has an office on the grounds east of Building No. 1, under the direction of Mr. C. A. Armstrong and will have a large force of men accessible at the close of the convention who will be prepared to crate, and deliver to the railroads, return shipments. This company handled nearly all of the exhibits coming in to the grounds and although greatly hampered on account of the local labor situation, was able to report to the director of exhibits, Mr. Hequembourg, each evening, that all less than carload shipments that had arrived in the city, had been hauled and delivered to their respective locations. It will undoubtedly prove of great advantage to a number of exhibitors to know that the Buckeye Transfer & Storage Company will take charge of their exhibits, pack them up and deliver them to the railroad after the convention is over, thereby obviating the necessity of the representatives remaining on the grounds or in the city and enabling them to return home promptly at the close of the exposition. In all cases where the shipments are heavy it would be desirable to have the smaller parts taken care of and boxed, and in cases where there are no small packages likely to be carried away, the transfer company has made arrangements with Mr. H. M. Patton, agent of the Big Four railroad, to issue bills of lading for the shipments while they still remain in the booths. This should not be understood to apply on small packages that would be liable to be carried away from the booths in the rush that will undoubtedly occur in getting away. The Buckeye Transfer & Storage Company has had a number of years of experience in handling matters of this kind both for various conventions and exhibitions that have been held in this city and for the state fair each season.

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Messrs. A. Morrison, H. P. Hubbell, C. J. Ellis, J. L. Adams and J. G. Carruthers, are the convention representatives of the Cambria Steel Company all reports to the contrary notwithstanding. Among other things that are on exhibition at the company's booth can be found the One Hundred percent joint and insulated joint and the company's standard guard rails for use on curves.

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Among the many other devices shown in the exhibit of the Ohio Brass Company, of Mansfield, Ohio, is the Armstrong journal oiler, manufactured by the Armstrong Oiler Company, of Philadelphia, Pa. This device is composed of a plush mat made in shape to conform to the car journal and held in position by a steel skeleton frame. In order that the plush mat may not rub under too great pressure, and thus become carbonized by friction, four wooden contact buttons hold it so that it feeds the oil freely and is not pressed into a solid mass. It performs its office in the manner of a wick and it is claimed that a saving of one-third in oil over wool waste is accomplished by this device and that it prevents oil from passing by dust guards to the wheel centers.

* * *

The Borne, Scrymser Company, of New York, are not exhibiting their large line of lubricants for electric traction needs, but they are always ready to talk lubrication in this field on any unit basis: gallon, engine hour, K. W. hour, or car mile.

* * *

The problem for suitable seating for electric and interurban cars has assumed large proportions judging from the elaborate display of the Hale & Kilburn Manufacturing Company, in Building No. 4 in which are shown over a dozen different styles of seats in plush, leather and rattan coverings, with high and low backs and without arm rests, from which a selection can be made to suit any requirement. We have just been advised that the entire seating equipment for 250 electric cars now building by a St. Louis car builder for the United Railways of San Francisco, has been selected from the Hale & Kilburn line. The requirements were maximum seating capacity for the passenger and minimum space in the car. These requirements are met by the Improved Walkover seat of the Hale & Kilburn Company, which permitted a 30-inch aisle while furnishing ample seating accommodation. With 50 cars recently furnished the United Railways the Hale & Kilburn Company report a total of 300 cars seating equipment for San Francisco adopted the present year.

* * *

There are many places about the property of a railroad company where the company is liable for damages if the foothold of pedestrians is insecure. Station stairways are frequently in bad condition and in this regard even when presenting the form of excellence to the eye. The harder the stone or wood the more certain it is to become slippery with wear. Car steps, particularly, are liable to become a source of expense and anxiety to officials and back platform accidents are frequent The Universal Safety Tread Company, 113 Devonshire St., Boston, Mass., has shown the steam roads of the country that the tread it makes is not only extremely economical for use in the location spoken of where the public service must be considered, but a great demand has arisen for the tread to be placed about the footway in tower houses of signal plants, where men are working constantly in a narrow space about the levers.

* * *

The Rail Joint Company, whose general offices are located at 29 West Thirty-fourth street, New York, is exhibiting in its commodious and well designed booth (Building 2, Section C, Space 10-13), its well-known continuous, Weber and Wolhaupter rail joints in the standard, insulated, and compromise types. These products have been in use many years and, as their popular use denotes, have brought successful results. The fact that the joints made by the Rail Joint Company have good base supports for the rail makes the pounding of the rail ends impossible and prolongs the life of the rail and electric rail bonds in a corresponding degree. By the application of this any of the forms of joints exhibited on tracks laid with old steel, low joints can be restored to the normal surface and the life of the rail thereby increased. The booth of this company is very appropriately decorated and carefully arranged for receiving and entertaining the many friends in attendance at the convention. The representatives of the company who may be found at the booth are: Messrs. James C. Barr, of Boston; Benjamin M. Barr, of New York; Guy A. Hagar and D. J. Evans, of Chicago; E. A. Condit, Jr., of Pittsburg; H. C. Holloway, of Cincinnati; J. G. Miller and C. E. Irwin, of St. Louis.

* * *

Two full size S. & W. couplers with which the entire system of the Northwestern Elevated Railroad of Chicago have been equipped by the Wallace Supply Company, are on exhibition in the booth at Nos. 12 and 13, Section B, Building No. 4. One of the couplers is known as the motor type and is attached to a special draft rigging which is equipped with a spring cage in which a single spring is mounted in combination with drawbar shank, thimbles and washers so making a very simple construction which brings the single spring under compression either in pulling or pushing the drawhead. The other coupler is known as the coach type and is similar to the motor type, excepting that it is so arrenged as to fasten to a T-rail in combination with the Barnes patent draft rigging, the latter being by no means new, but an old and tried draft gear, which has proven satisfactory in service. The S. & W. coupler is in use on the underground Railway of London.

* * *

The Electric Service Supplies Company, of Philadelphia, Chicago and Keokuk, Ia., occupy a space in Building No. 1, Section A, decorated in mission style with red walls, colonial yellow frieze and dark green floor. Above the frieze appear large signs illuminated by reflected lights. The frieze of this exhibit is covered with Southern smilax. Throughout the spaces are palms and other potted plants. A large reception room is formed at one end of the exhibit. This space is occupied by desks, stenographer, telephones and comfortable mission-style chairs. Among the articles manufactured by the Electric Service Supplies Company may be mentionel rail bonds, the automotoneer, Keystone overhead materials, third-rail insulators, rail-bond compressors, Keystone cars, Garton-Daniels lightning arrestors, Keystone vestibule shades, car telephones, Keystone cable racks, Philadelphia car fenders, portable lamp guards. Among the other specialties controlled by the Electric Service Supplies Company are exhibited samples of Lyon sheet-steel gear-cases, which attract widespread attention, Brady bearings, testing instruments, construction and linemen's tools, high-tension malleable pins, Locke high tension insulators, a full line of Sterling varnish, etc. Among the more attractive features of this exhibit is a piano which adds diversion. This being the first convention at which the Electric Service Supplies Company has made an exhibit, the effect of its representation is very satisfactory to the members of the company. Among the representatives present are the following: Charles J. Mayer, president; A. H. Englund, treasurer; J. W. Porter, first vice-president; Max A. Berg, secretary; J. V. E. Titus, second vice-president; G. W. Cox, Keokuk office; H. G. Lewis, Philadelphia office; John McSorley, Philadelphia office; William A. Armstrong, Philadelphia office; F. B. Massey, Philadelphia office; Benjamin Hayller, Jr., Philadelphia office; Robert Montgomery, Philadelphia office; James Stewart, Philadelphia office; E. R. Mason, Chicago office; John M. Gallagher, Chicago office; W. P. Cosper, Chicago office; Edward Hammett, Pittsburg office; Henry R. Swarley, Jr., New York office; C. E. Watts, Atlanta office; Ernest Boehme, St. Louis office; H. L. Adams, Chicago office; Joseph B. Noros, Philadelphia office; C. H. Bristol, Chicago office, and S. F. Alden, San Francisco agent.

* * *

The Columbus Railway & Light Company has the distinction of being the first electric railway company in this country to use Galena-Signal oil, having placed an order for this lubricant about ten years ago. Mr. Charles Hott, master mechanic of the Columbus Railway & Light Company, placed this order and invented an oil cup that has since been successfully used in applying the oil to car journals. The Galena-Signal Oil Company's exhibit is interesting chiefly not for what can be seen in the way of products exhibit, but rather for the talent for which the company's twenty representatives are severally and individually famous. It is largely due to the campaign of education carried on in the railway field by these experts on lubrication that about 97 per cent of the railways of the United States are exclusively using the oils make by this company.

* * *

The Yale & Towne Manufacturing Company is exhibiting two new types of high voltage electric hoists designed especially for street railway power circuits. These may be used where the voltage fluctuation is great. They are particularly applicable to boiler room repair, shop and car barn service. A 20-ton chain hoist of the "Triplex" type is also on exhibition in the booth which is located in Building 3, Section A. The company is represented by Chas. W. Beaver and Harry E. Dickerman.

* * *

The General Electric Company's exhibit space is lighted by 250-watt Gem lamps with Holophane reflectors. Besides these, the new Tantalum lamp is also used in the most effective manner. In other respects the General Electric Company's arrangements at the convention were complete. In the Southern Hotel the headquarters and bureau of information were established on the mezzanine floor, where a private telephone line was installed. At the Fair Grounds the exhibit contains an unusually attractive reception quarters with telephone, stationery and literature at the disposal of visitors.

* * *

Extraordinary interest has been manifested by railway men in the Lintern classification and marker system and the Tomlinson car coupler, both of which patented devices are shown in actual operation at the exhibit of the Ohio Brass Company, located in Section B of Building No. 1. Both of these devices are new and the results of operative tests go to show that they will soon become a part of standard equipment, and all railway men should be glad of this opportunity for familiarizing themselves with them.

* * *

The Western Electric Company has recently contracted with the Columbus & Hocking Clay Construction Company, of Columbus, O., to furnish three 550-kilowatt, three-phase alternators operating at 150 revolutions per minute, direct connected to gas engines and guaranteed to run in parallel. The contract also covers two 50-kilowatt exciters operating at 225 revolutions per minute, direct connected to gas engines, a large switchboard, 800 kilowatts in transformer capacity, and thirty arc lamps.

* * *

The Macdonald Ticket & Ticket Box Company, of Cleveland, Ohio, has closed orders since the opening of the convention for 3,250,000 Macdonald cash receipt holders. This firm has its exhibition in Building 3, Section B, Space 2, where old and new friends are being welcomed. Mr. Murdock Macdonald is in charge of the booth.

* * *

R. W. Marshall & Co., of 95 Liberty St., New York, are represented at the convention in the person of R. W. Marshall, who is making all the halls his headquarters.

* * *

The exhibit of the Liberty Bell Company of Bristol, Conn., which is arousing much interest, is devoted to an exposition of Liberty high-speed trolley wheels and cushion harps. The wheed axles turn freely in their bearings in taking curves and switches, and the cushion harp gives a tension at the upper as well as the lower end of the trolley poles, so that the wheel hugs the wire closely and at the same time at the strain on the wheel and especially on the overhead material is lessened.

* * *

The Standard Motor Truck Company is showing three of its motor trucks, the most interesting being a single truck suitable for a 36-foot car, with an especially long spring base, because it has springs at the ends of the truck, as well as at the journals. An especially heavy truck, designed for an 80,000-pound car for the Pittsburg & Butler Street Railway, is another. Messrs. A. W. Field ana Mr. W. G. Price are the representatives.

* * *

The booth of the Climax Stock Guard Company in Building 6, Section B, is enclosed on two sides by Climax farm crossing gates. Messrs. Fred V. Stewart and F. W. Stewart are on hand to explain the merits of these gates, as well as the Climax clay cattle guards, which are illustrated by full-sized sample sections and a miniature wooden model of a complete guard crossing.

* * *

The International Register Company of Chicago, which has an exhibit at the convention, is the manufacturer of the "International" and "New Haven" fare registers. These registers are made in several types, both single and double, including the portable register. In 1903 the business of the New Haven Car Register Company, of New Haven, was purchased and its entire stock and equipment moved to Chicago. The company also manufactures a complete line of fittings for use in connection with the register, including cords, straps, pulleys, etc., besides selling ticket punches, enamel badges for employes, uniform caps and buttons, car hand-straps and a line of Barrett jacks. A full supply of interchangeable repair parts for all types of "International" or "New Haven" registers manufactured in recent years is kept on hand. The company is represented at the convention by John Benham, vice-president; A. L. Tucker, secretary; W. G. Kinchoff, superintendent, and A. N. Loper.

* * *

The Ramapo Iron Works, of Hillburn, N. Y., is showing in Building No. 2, its automatic return switch stand No. 12. This stand is designed for interurban electric railways and is made in three styles, high, medium and low. The special feature of these stands is that they are automatic under all conditions, opening by the car trailing through the switch and returning automatically to the original position. The throw is positive, the targets are rigidly connected with the switch points and always indicate their actual position.

* * *

Flexible steel armored hose is now being used by some street railway companies for charging the air tank on street cars. In the steel armored hose made by the Sprague Electric Company, of New York, the armor interlocks and by this feature absolutely prevents expansion and external abrasion. The hose, being wholly encased, is immensely strengthened, a three-ply hose withstanding hydraulic pressure of 2000 pounds.

* * *

In the exhibit of the Taylor Truck Company may be seen the Taylor malleable iron wheel center for steel-tired wheels. This center is said to be about one-half lighter and five times stronger than grey iron. The wheel is noiseless in service and the tire is easily renewed.

* * *

The Consolidated Engine Stop Company, of New York, has so arranged its exhibit that it practically becomes a working model of the company's apparatus even to the latest system of testing currents. Besides being the manufacturer of the Monarch engine stop and speed limiting system the company is showing the Springfield Corliss engine stop, a speed limit device especially designed to controlling the Parson's turbine.

* * *

Among the electrical specialties which are attracting much attention are the motor leads exhibited in Building 3, Space 8, Section A, by Dossert & Co., of New York, manufacturers of the well known Dossert joints. These motor leads are easily connected and disconnected, making a neat and compact joint, and their use obviates the difficulties of soldering in car wiring repair work, especially in pits. The joint is made with a Type A Dossert 2-way connection fitted with an adjustable insulating composition cover constructed so that it cannot be loosened by vibration but may be easily disconnected by hand if desired. The device has been most favorably commented upon by all the car wiring men who have seen it.

* * *

The St. Louis Car Company intended exhibiting one of the Kobusch & Wagenhals oil-burning motor cars at this convention, but the Chicago & Alton Railway Company is experimenting with it and could not spare it. This car was recently described in the railway age.

The St. Louis Car Company, St. Louis, Mo., secured an order yesterday from the Chicago Union Traction Company, of Chicago, for 100 double-truck motor cars.

* * *

A car motor-lift is being shown in the exhibit of the Watson-Stillman Company. This tool is designed for use in the pit of the car house, for dropping the motor down and rolling it out from underneath the car. It is complete in itself, and has been found to be a very desirable tool. The jack is mounted so there is side adjustment of two inches. The pump will raise 3000 pounds 12 inches high in 30 seconds. The total height of the jack from the floor to the ram-cap is 34 inches in the regular pattern.

* * *

The exhibit of the Chase-Shawmut Company of Newburyport, Mass., is located in Building 3 and is in charge of F. D. Masterson, of Boston. At this display may be seen the Shawmut soldered rail bond which this company has been marketing for some seven years. The 1906 bond is an improvement over former types and consists of a collar encircling the strands at the center of the loop of the bond to prevent the laminations from spreading, riding above the head of the rail and consequently cutting.

THE WESTINGHOUSE EXHIBITS.

Included in the Westinghouse exhibit is a complete line of detail apparatus, such as circuit breakers, lightning arresters, fuses, fuse blocks, etc., and a line of switchboard instruments. The types of car circuit breakers manufactured by this company are recognized as standard and are in operation on most of the electric lines in the country.

The Westinghouse M. P. (Multipath) lightning arrester, which is suitable for either alternating current or direct current service, embodies a new principle. By a special method of development tests, an arrester has been produced which has an indefinite length of life and offers a freedom of discharge many times greater than any low voltage arrester now on the market. The arrester takes its name from the fact that the static discharge separates itself over the block along a number of minute discharge paths, multipath, hence the name. The voltage across each gap is very small, therefore the line cannot maintain an arc across them.

The Westinghouse Traction Brake Company has working racks of the following air brake equipments:

Type S M I—Straight air brake for single-car operation only.

Type S M E—Straight air brake with emergency feature, for two-car trains only when a single car operation most of the time is desired.

Type A M S—Automatic air brake for two-car trains, the second car being a non-motor trailer; or single car operation if desired.

Type A M M—Automatic air brake for trains of from one to five cars; also single car operation if desired.

Type A M R—Automatic-Electro-Pneumatic, for trains of more than five cars; particularly adapted for elevated service. The electro-pneumatic features can be used with any of the improved automatic systems.

The exhibit also includes a motor-driven blowing outfit.

In connection with the exhibit of the Westinghouse Traction Brake company, there is shown a working model of the American automatic slack adjuster, manufactured by the American Brake company, of St. Louis, Mo.; also an automatic air and steam coupler, manufactured by the Westinghouse Automatic Air & Steam Coupler Company, of St. Louis.

A number of cars on exhibit in other sections are fully equipped with Westinghouse air brake apparatus of the improved type. Among these are the following: A car of the Lexington Railway Company, manufactured by the American Car Company; a steel car of the Boston Elevated Railroad, manufactured by the Pressed Steel Car Company, and a Brooklyn Heights Railroad car manufactured by the Jewett Car Company.

Referring to the air brake equipments, a short description of the different types is of interest. The S M I straight air brake equipment consists essentially of an air supply, a main reservoir and a brake cylinder, a foundation brake leverage transmitting the brake effort from the brake cylinder to the wheels, a brake valve for admitting air from the main reservoir to the brake cylinder and in return releasing the pressure, and a governor for controlling the pressure in the main reservoir and cutting the pump out of operation when the desired maximum pressure is reached. This equipment represents the highest type of straight air brake and is intended for use on single cars only, since the moment two cars or more are operated together as a train, it is absolutely necessary to apply some form of automatic brake in order to be able to control the separate car in case of a break-in-two.

The A M M equipment is shown in a five-car train arrangement. The equipment is designed for use in trains of from three to five cars, consisting of all motor cars or motor and trailer-car combinations, as may be desired. The equipment is essentially an automatic brake and is designed for either a single pipe line or an additional control pipe line as desired, depending upon the operating conditions of the road on which it is to be installed. It consists of a very simple brake valve in the released position of which a wide open connection is made from the control line beyond the feed valve to the brake pipe, therefore securing feed-valve pressure on top of the rotary, which prevents the overcharging of the brake pipe and consequently of the auxiliary reservoirs on the front part of the train. This particular feature cannot be too strongly emphasized, as it is a very important point in connection with the satisfactory handling of short trains, and especially single cars, with automatic brakes. This is a very popular form of automatic brake, especially for interurban train service.

The A M R equipment is also shown in a working five-car train model. This equipment is designed for use on trains of any length, but more particularly for those longer than five cars. This brake has all the features of quick-recharge and graduated release that pertain to the A M T equipment, and has in addition regular Westinghouse quick-action features in the triple valves and a new departure in the matter of a quick-service feature. This equipment is an automatic air brake of the highest type, with all the additions and refinements that the present train operation requires. The features embodied in this one equipment are graduated release, quick re-charge of auxiliary reservoirs, quick-serial service application, no overcharging of brake pipe, prompt response of triple valves after release, uniform operation of all compressors in a train, and a single hose pipe only will accomplish this under certain conditions.

The A M S equipment is intended only for use on a motor car and a non-motor trailer train where the cars are likely to be operated together the major portion of the time. The equipment consists of a very simple brake valve in the release position of which a wide open connection is made from the feed valve to the brake pipe, so that the feed-valve pressure is on top of the rotary at all times, and not the variations of the main reservoir pressure. The application of the brakes is made in the regular automatic way by a reduction of pressure in the brake pipe, both in service and in emergency. In this equipment the motor car is always provided with straight-air release.

This equipment is the automatic brake in its simplest form and yet at the same time designed to meet the new conditions of surface car operations in two car trains where a lighter car is hauled behind a heavier motor car.

The S M E equipment is intended only for two-car trains, consisting either of a motor-car and trailer or two motor-cars. This equipment as applied to two-car trains provides what is in effect an ordinary straight-air brake for service stops. In emergency, however, a brake-pipe line in which pressure is maintained and an exceedingly simple emergency valve provide for automatic applications in event of the train breaking in two or at the will of the motorman. In addition, motor-cars on which the S M E apparatus is installed may be operated singly, as in ordinary straight-air brake practice.

The motor-driven blowing outfits mentioned are made for both alternating or direct current service, and being mounted on trucks are particularly useful in car barns and power houses for cleaning generators, motors, or dusting out cars. They are exceedingly simple to operate and are easily understood by any-one of ordinary intelligence.

The Westinghouse interests have a number of their men in attendance to receive visitors, both at the Fair Grounds, where the exhibits themselves are located, and also at the Westinghouse headquarters in Parlor G, Southern Hotel, where every convenience is provided for the entertainment of visitors, including telephone service, automobiles for trips to the Fair Grounds and back.

The apparatus mentioned includes only a few of the more important parts of the exhibit, which taken throughout, is interesting to railway men.

B. W. Stone is at the convention representing the E. W. Bliss Company of Brooklyn, N. Y., manufacturers of motor glass and pinions. Mr. Stone is making the booth of W. R. Garton Company his headquarters, where a line of their goods are displayed.

SEMI-CONVERTIBLE CARS FOR CENTRAL PENNSYLVANIA TRACTION COMPANY.

The J. G. Brill Company shipped a few weeks ago to the Central Pennsylvania Traction Company, of Harrisburg, five of its semi-convertible grooveless-post cars, the shipment making the third lot of cars of this type received by this company within the recent past. The cars of the present order, however, differ from their predecessors in that longitudinal seats are used instead of seats transversely arranged—a somewhat unusual specification in a semi-convertible car. In other respects the cars do not differ materially from the majority of semi-convertibles. The window system is exactly the same as that shown in the car for the Boston Elevated Railway on exhibition at this convention. One of the features not to be overlooked is that since the sashes are stored in the roof instead of in wall pockets behind the seats, they are free from all possibility of careless passengers using the wall pockets as rubbish receptacles, which usually results in broken or scratched glass when an attempt is made to raise the sash. The largest possible window space and the ease with which the sashes are operated are desirable features. The dimensions of the cars as as follows: Length over end panels, 25 feet and over crown pieces 34 feet, 5 inches; width over sills, including plates, 7 feet, 2 inches, and over posts at belt, 8 feet, 2 inches; size of side sills, 4 feet, 7¾ inches; end sills measure 5¼ inches by 7⅞ inches; sill plates, ⅜ inch by 12 inches by 5⅞ inches. The cars are finished in cherry and ceilings are of birch, decorated. Numerous Brill specialties are employed throughout the car, namely, alarm and signal bells, sand boxes, angle iron bumpers, etc.

Interior of Semi-Convertible Car for Central Pennsylvania Traction Company, Showing Longitudinal Seats.

PEERLESS PRODUCTS.

The Peerless Rubber Manufacturing Company, New York, includes among its products a very complete line of mechanical rubber goods. Among these are the following:

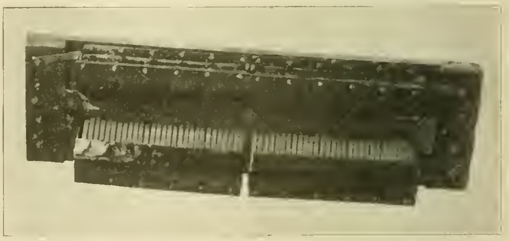
The "Perfected" pneumatic hose is made with an inner tube of special compound suited to withstand the action of oil and water which is often carried through pipes connected with air compressors. The materials are so chosen that the hose is not affected by hot air, which often passes through the pipes when there is insufficient storage capacity to permit cooling or where the water jacket or cooling appartus is of limited capacity. Another brand, the "Perfected" steam hose, is this company's highest grade, designed for pressures greater than 80 pounds per square inch. The life and elasticity of this type of hose is quite permanent. Another type of hose is designed for carrying water for washing boilers. It is suited for use with hot water and steam in pressures up to 20 pounds and it is stated that the materials will not crack with heat under severe service. This company also manufactures hose suitable for distributing sand on track rails.

The "Eclipse" sectional "Rainbow" gaskets made by this company are well known. It is stated that these gaskets are made of the celebrated "Rainbow" packing compound and that by their use joints can be made in from three to five minutes. These gaskets can be fitted to any size of man-hole or hand-hole plate in use and a perfectly tight joint thus obtained.

The "Peerless" piston and valve-rod packing is made with round "Rainbow" rubber core. This is surrounded by layers of soft loosely-woven duck thoroughly impregnated with a high grade of plumbago from which the grit and acid have been removed Such packings will hold steam at 400 pounds pressure and in high-speed engines will last from 12 to 18 months under ordinary conditions. The "Rainbow" sheet packing has been in use during the past 15 years and at the present time is reported as standard for 85 per cent of the plants throughout the United States. It is also extensively used in foreign countries. This packing is designed to stand the highest pressures without blowing out and is not affected by steam at high temperatures. It is also suitable for joints which carry oil, ammonia, steam for heating, or alkalies. Still other products of the Peerless Company are car-step mats with metal insertion, made in various designs and sizes up to 80 inches wide and feet long step and perforated mattings in widths up to 6 feet and "Peerless" trolley dodgers of the requisite consistency and wearing qualities to give satisfaction.

EUREKA AUTOMATIC SIGNALS.

The Eureka Automatic Electric Signal Company, Tamaqua, Pa., manufactures two systems of block signals, as well as crossing bells and steam crossing semaphores. The "single-wire" is an absolute block system which admits but one car at a time. The "two-wire," of greater flexibility, is a permissive-block system which, by means of intermediate signals protect from two to 25 cars, moving through the block, and displays danger signals to cars approaching the block from the opposite direction. The two-wire system has been developed during the past year to operate semaphores, and provides that the home semaphore must be raised from danger, its normal position, before a car may take the block. The condition of the block, whether it is occupied or not, and if occupied in which direction the car or cars are moving through it, is indicated to cars approaching the block from either direction.



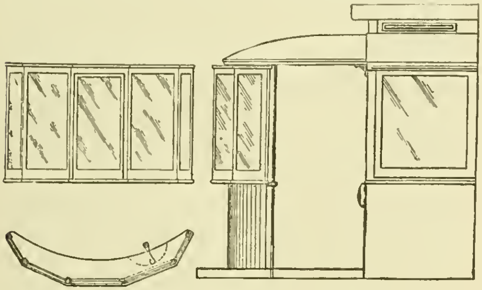
Eureka Automatic Signal—Contact Maker.

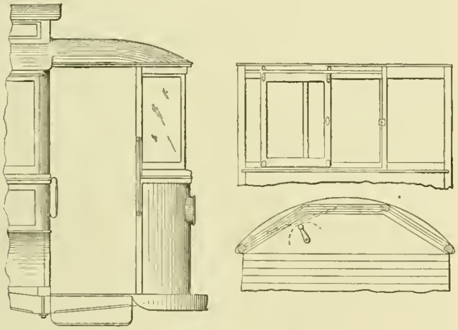
A controller has just been developed that operates perfectly with cars runing above 60 miles per hour. The contact-maker of the Eureka company is one of its special features. It overcomes the liability of the trolley-wheel being thrown off the wire, especially when the car is travelling at a high speed. As shown in the illustration, it consists of steel combs, with the teeth facing inward and of sufficient flexibility to permit the trolley-wheel to accomplish its bridging action without jump or jar.

Many of the prominent interurban railways have installations of Eureka signals.

A SLIDING SASH VESTIBULE FOR CLOSED CARS.

A method for vestibuling closed cars by which a sliding sash is substituted for the hinged or pocket types, has been devised by J. P. Sjoberg & Company, of New York, for use on five-light and three-light vestibules. The center sash is hung from an angular steel track, the sash being attached to swivel sheaths, which, while following the curve or angle of the track permit the sash to move freely to a position over one of the side lights. The sash is also guided at the bottom by plates in each corner, having rollers which run between guide strips. The sliding sash avoids the necessity of pockets on the inside of vestibules thus saving the expense of paneling and preventing interference in the front of the car with the brake and controller stands and headlight. No routing or grooving of the pillars for the sashes is necessary. The side lights are fastened into the frame of the vestible or immovable sash frames. A sash fastening which serves as a handle to operate the sash holds the movable sash in position when closed. The free swing of the controller handles is assured by having the portable vestibules project a few inches over the dash. The idea evolved by Sjoberg & Company has practically been adopted as standard by the Brooklyn Rapid Transit Company. In equipping a large number of cars this company adopted the suggesting of employing narrow brass channel stiles in the construction of the center sash thereby minimizing the obstruction of the motorman's view.


Sliding Sash on Five-Light Vestibule.


Sliding Sash on Three-Light Vestibule.

COMPROMISE THERMIT WELDS.

Those who attended last year's convention at Philadelphia, will recall the interesting demonstrations of Thermit welding made by the Goldschmidt Thermit Company of New York. This company is again giving, each day, similar demonstrations, showing the simplicity of the process as developed for welding rails, so that a maximum life of track may be secured. The representatives are, however, showing an application of the system which will prove most interesting to roadway engineers; that is, the welding of compromise joints. Any process which can eliminate absolutely the difficulties of maintaining this class of joints, can not fail to attract the attention which it is justly receiving. The application is the same as for straight-away work and these joints can be welded in place, or short rails of each section can be jointed and then cut in the track at the desired point. Permanence, as regards electric return, and ease of application to the most widely different sections, are the chief features of this process.

SYMINGTON BOXES AND BALTIMORE BEARINGS.

The fact that many of the largest electric city and interurban roads have adopted trucks of approximately M. C. B. design has opened up a new field for the use of M. C. B. journal boxes, especially under cars requiring 3¾ by 7-inch journals or larger. The radical difference between ordinary electric service axle lubrication and the standard American steam practice has lately been sharply contrasted, and the feeling in favor of saturated waste lubrication is becoming daily more general as electric trucks approach in design and capacity the trucks used by steam roads.

The passenger boxes manufactured by the T. H. Symington Company, Baltimore, Md., are designed to satisfy the demand for a durable, efficient dust-proof and readily accessible journal box of standard dimensions. The semi-steel of which these boxes are made is said to be 50 per cent more durable in pedestal fits, where abrasion occurs, than malleable iron. It can readily be machined, thus overcoming the lost motion occurring between the brass and the interior of the box and that between the box and pedestal, which is, of course, an important factor in the prevention of surging of trucks.

The lid and lid seat of the Symington box are machined. This, in conjunction with a very heavy spring, giving a central spring pressure of 150 pounds, has proved a most practical method of applying a dust-proof lid which at the same time is accessible and can readily be opened. The interior of this type of box is strengthened by ribs, which facilitate packing and prevent the lubricating waste from rotating with the journal or dropping away from it, a prolific source of hot boxes. Symington journal boxes have been adopted on nearly all of the most important electric roads in the country.

The Baltimore ball bearings which are also sold by this company are designed to overcome the friction occurring between car body and truck when cars are rounding curves. Their durability has been proven by the fact that since the company has been manufacturing the improved type there has not been reported a failure or complaint due to the wear of the material. It has been shown in a number of instances that the saving in friction is directly shown in an increased life of the wheel flanges on cars that have been equipped with the bearings, this increased mileage running as high as 15 and 20 per cent on chilled wheels and showing about the same increase in mileage between turnings of steel wheels.

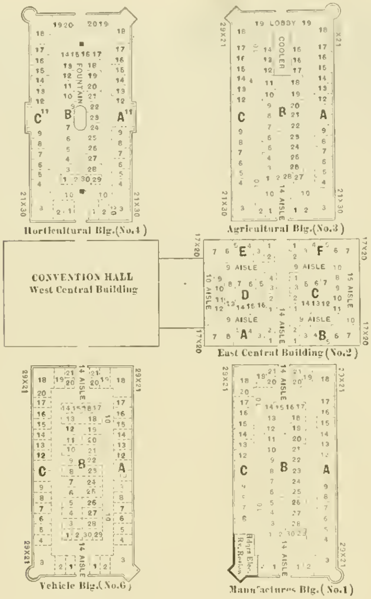
The balls in the Baltimore bearings are suspended in each instance in the body member, consequently dust and dirt do not interfere with their action. No lubrication is required on either center or side bearings. The bearings are so manufactured that the ground race-plates on which the balls run are correct to the thousandth part of an inch, as also are the finished balls. The race-ways are automatically assembled with the malleable castings by means of electric chucks, thus assuring a correct device for the duty required.

There are at present about 100 representative electric railways in the United States with trucks equipped with the Baltimore ball bearings, and the general report of their good condition and the evidence of economy in flange wear has been practically unanimous.

THE LIST OF EXHIBITS.

Acme Automatic Street Indicating Company, Cleveland, O.—Building 4, Section A, Space 10-11.—Display, working from electric push button of a number of Acme automatic street indicators, revolving capacity 1,000 stations per indicator. Represented by Major C. W. Johnson, Peter Small, T. W. Small and Frank Brueggeman.

Adams & Westlake Company, Chicago—Building 4, Section B, Space 26-27.—Signal lamps, headlights, car-trimmings, brake-handles, switch-lamps, electroliers. Represented by Fred B. Jones, G. L. Walters and Wm. J. Piersen.



Floor Plan of Exhibit Buildings.

Allis-Chalmers Company, Milwaukee, Wis.—Building 3, Section A.—Machinery and large framed photographs illustrative of complete electric railway equipments—for power houses, sub-stations, cars, and lines, including Christensen air-brake apparatus; supplemented by bulletins; also model showing the stationary and movable blading of an Allis-Chalmers steam turbine. Represented by F. C. Randall, W. S. Doran, W. W. Power, F. C. Colwell, M. W. Thomas, W. J. Buckley, J. W. Gardner, J. W. Murray, W. T. McCaskey, J. H. Denton, Geo. Voigt, G. B. Foster, W. S. Heger, A. H. Whiteside, H. A. Strauss, H. A. Buell, C. A. Tupper, B. A. Behrend, David Hall, E. Mattman, O. Bogene, W. P. Spellmir, A. Brodock, F. Webster, W. J. Richards, A. M. Libby, W. D. Pomeroy and B. Ellshoft.

American Advertising Indicator Company, St. Joseph, Mo.—Building 6, Section A, Space 20.—American Advertising Indicator. Represented by Graham Burnham, Gerald Livergood and Clifton George.

American Brake Company—See Westinghouse.

American Brake Shoe & Foundry Company, Mahwah, N. J.—Building 3, Section B, Spaces 9-10.—Brakeshoes and brakeheads. Represented by W. S. McGowan, F. W. Sargent, E. L. Janes, F. L. Gordon, R. T. Hatch and J. S. Thompson.

American Car Company, St. Louis.—Machinery Hall—See J. G. Brill Company.

American Instrument Company, Philadelphia, Pa.—Building 3, Section B, Space 6.—American high grade direct-current voltmeters and ammeters, both switchboard and portable types. Represented by James G. Biddle, A. O. Benecke, T. G. Seixas and A. B. Weeks.

American Locomotive Company, New York.—Machinery Hall.—Motor trucks built for the New York Central & Hudson River Railroad to be equipped with two motors of 200 horse power each, to be supplied by the General Electric Company; load on center plate 40,000 pounds, weight of motors 15,300 pounds, weight of truck and motors 27,700 pounds; one trailer truck for the same company, load on center plate 38,000 pounds, weight complete 11,000 pounds. Represented by Wm. M. Wampler and H. B. Hunt.

American Mason Safety Tread Company, Empire Safety Tread Company, Boston.—Mason safety tread for car steps, Empire carborundum safety tread. Represented by Henry C. King and J. W. Scott.

American Railway Supply Company, New York—Building 1, Section B, Space 1.—Badges for conductors and motormen. Represented by Walter Chur.

American Sewer Pipe Company, Pittsburg—Building 6, Section B, Space 25.—Sewer Pipe. Represented by J. M. McClave, Earl J. Hawke and F. N. Kondolf.

American Steel & Wire Company, Chicago, Ill.—Building 4, Section C, Space 16-17.—Rail bonds, wire, trolley wire, wire fence and a complete line of rail bonding tools. Represented by George Cragin, C. S. Marshall, F. A. Keys, C. S. Knight, B. B. Ayers, R. K. Sheppard, J. D. Sutherland, E. Banchards, George Long, George Chandler, Henry Pratt, C. R. Sturdevant, J. M. Holloway and Thomas Lavin.

American Water Softener Company, Philadelphia, Pa.—Building 6, Section B, Space 24.—Working model of water-softening plant and photographs of plants that have been installed. Represented by A. S. Garrett, W. H. P. Fisher, A. W. Bartlett and Hugh Dunlavey.

American Wire Fence Company, Building 6, Section A, Space 13—Reenforcing for concrete construction. Represented by D. J. Calkins and W. A. Collins.

Anderson Manufacturing Company, Albert and J. M., Boston, Mass.—Building 3, Section B, Space 23.—Trolley line material, Anderson time switch, Anderson knife switches. Represented by Ernest Woltmann, William W. Hincher and J. M. Anderson.

Atha Steel Casting Company, Newark, N. J.—Building 3, Section A, Space 9.—Titan steel motor gears and bolsters. Represented by Louis A. Shepard.

Atlas Railway Supply Company, Chicago, Ill.—Building 4, Section B, Space 28.—Atlas supported and suspended rail joints for tee and girder rails, Atlas compromise or step joints, special rail joints, plain braces and tie plate braces, tie plates, switch stands and primer and surfacer for passenger cars. Represented by J. G. McMichael and D. Thomson.

Bache & Company, Semon, New York.—Building 3, Section B, Space 7.—Glass, mirrors, signal glass. Represented by F. J. Goertner and H. C. Fechheimer.

Baker Art Gallery, Columbus.—Building 6, Section A, Space 11.—Commercial photographs. Represented by D. N. Baker.

Baldwin Locomotive Works (Burnham, Williams & Company), Philadelphia, Pa.—Building 1, Section A, Space 5-6.—One truck in this space, four trucks under cars in Niles exhibit and two trucks under cars in Jewett exhibit. Represented by John R. Dickey and Warren Thorpe.

Baldwin Steel Company, New York—Building 2, Section D, Spaces 8-9-10.—Hudson high-speed steel, twist drills, gear cutters, milling cutters, taps, reamers, end mills, metal slitting saws. Represented by W. L. Stone, T. S. Hanna and H. L. Raynor.

Baldwin & Rowland Switch & Signal Company, New Haven, Conn.—Building 6, Section B, Space 20.—A recording signal operated automatically. Represented by H. Rowland and George A. Simonds.

Bayonet Trolley Harp Company, Springfield, O.—Building 4, Section B, Space 17.—Bayonet detachable trolley harps and harp supplies, "Butterfly" sleet-cutters, Bayonet detachable trolley-pole clamps and arms. Represented by Jacob M. Olinger, R. A. Garlough and C. S. Olinger.

Berry Brothers, Detroit, Mich.—Building 4, Section C, Space 10.—Panels finished with inside and outside coach varnishes. Represented by William Stridiron, Thomas Lawler and Frederick W. Hormann.

Bird & Son, F. W., East Walpole, Mass.—Building 6, Section C, Space 10.—Paroid roofing, Neponset waterproof papers for sheathing purposes, special papers. Represented by Frank Lowe.

Blake Signal & Manufacturing Company, Boston, Mass.—Building 3, Section A, Space 10.—Blake signal. Represented by C. C. Blake, E. J. Burke and Geo. S. Hastings.

Booth Company, L. M., New York—Building 4, Section B. Space 15.—Photographs, blue prints and drawings of installations of the Kennicott water-softening plants. Represented by L. M. Booth, E. Richardson and Frank S. Dunham.

Bowser & Co., S. F., Fort Wayne, Ind.—Building 4.—Oil storage systems, oil tanks and pumps, self-measuring oil tanks. Represented by C. A. Dunkelberg and W. T. Simpson.

Brady Brass Company, Jersey City, N. J.—Building 1, Section B, Spaces 18-19.—Motor bearings for electric railways. Represented by Daniel M. Brady, George C. Morse, Chas M. Reubens and W. F. Kranz.

Brill Company, J. G., Philadelphia—Machinery Hall.—G. C. Kuhlman Car Company, Cleveland, American Car Company, St. Louis, and Stephenson Car Company, Elizabeth, N. J.—Various styles of cars made by these companies, among them two "Pay as you enter cars" built for the Montreal Street Railway Company. One of these cars was built by the Montreal Street Railway Company and is exhibited in the Brill exhibit, the other car was built at the G. C. Kuhlman Works, one 30-foot single-end Brill semi-convertible car built for the Toledo Railway & Light Company, one 50-foot combination baggage, smoker and passenger car built by the American Car Company; one combination steel car built by the J. G. Brill Company for the Boston Subway, one Brill 20-foot full convertible car built by the American Car Company; in addition to these cars is shown a Brill 27-F. E. No. 1 truck, Brill 27-E, No. 2 solid forged frame trucks and other specialities. Represented by S. M. Curwen, W. H. Heulings, Jr., Geo. M. Haskell, Geo. H. Tontrup, F. L Markham, D. B. Dean, Elwood Brill, Bryon O. Brill and Fred Brill.

Brown, Harold P., New York—Building 3, Section B, Spaces 3-4-5.—Plastic rail bond, plastic plug rail bond, solid copper rail bond, Brown electrical contact alloys, hand power rail grinders, flexible shafts, high-speed electric rail drill, pneumatic rail drill, magnetic drill clamp, electrical testing bureau with 3,000 amperes capacity, insulated third rail, amalgamated switch contacts. Represented by Harold P. Brown, Chris. Eccles, Robert K. Fast, F. Bissel, F. H. Brown, James Hollowood, Julius Alsberg, C. B. Coates, Geo. M. Hoadley, Albert Temple, John Roach and J. M. Coote.

Buckeye Engine Company, Salem, O.—Building 4, Section B, Space 1.—Engine model. Represented by C. H. Weeks, V. T. Price and G. W. Pope.

Buhne Metal Packing Company, New York.—Building 6, Section A, Space 5.—Fibrous Babbett steam packing. Represented by T. M. Remington.

Burroughs Adding Machine Company, Detroit—Building 6, Section A. Space 2.—Adding machines. Represented by G. H. Pagels and C. F. Fenner.

Calman & Company, Emil, New York—Ohmlac coils insulated with solid compound. Represented by H. Lee Bragg and W. A. Conway.

Cambria Steel Company, Pittsburg, Pa.—Building 2, Section C, Space 1.—100 per cent rail joint, 100 per cent insulated rail joint, T-rail guards for street railway use. Represented by A. Morrison, J. L. Replogle, H. P. Hubbell, J. L. Adams, C. J. Ellis and E. D. Rogers.

Capital Lock-Nut & Washer Company, Columbus.—Building 6, Section B, Space 8.—Lock-nuts, bolts, nuts and structural rivets. Represented by L. R. Ayers and T. H. Ryan.

Carey, Phillip, Manufacturing Company, Cincinnati, O.—Building 6, Section B, Space 16.—Carey's magnesia flexible cement roofiing and all kinds of asbestos materials. Represented by James H. Cooper, John O. Davies and Miss Harriet Wood.

Carnegie Steel Company, Pittsburg, Pa.—Building 2, Section A, Space 17.—Complete girder-rail branch-off, mounted on complete set of steel switch ties, steel cross-ties. Represented by W. P. Siebert, N. M. Hench, L. C. Lustenberger, F. W. Highberger, A. M. Harper, W. A. Bostwick, John E. Woods, R. A. Bruce, R. H. Graham, K. E. Porter, F. C. Deming and F. C. Brunke.

Cary Automatic Couplers Company, Chicago—Building 6. Section A, Space 21.—Cary automatic car couplers and Cary automatic train-pipe couplers. Represented by Clarence W. Taylor and Boleslaw R. Kozlowski.

Chase Foundry & Manufacturing Company, The, Columbus, Ohio—Building 6, Section B, Spaces 21-22-23.—Express and baggage wagons, factory and railroad trucks and industrial cars. Represented by S. M. Chase and W. C. Stocklin.

Chase-Shawmut Company, Newburyport, Mass.—Building 6, Section C, Space 8.—Shawmut soldered rail bonds. Represented by Frank D. Masterson.

Cheatham Automatic Electric Switching Device Company, Louisville, Ky.—Automatic electric track switch. Represented by R. V. Cheatham and S. C. Brandon.

Chicago Pneumatic Tool Company, Chicago—Building 3, Section B, Space 3-4-5.—Electric drills and grinders for rail bonding wound for line voltage, and a complete line of pneumatic drills and hammers. Represented by J. W. Duntley, W. O. Duntley, C. E. Walker, C. B. Coates and Edward Aplin.

Cincinnati Car Company, Cincinnati, O.—One 61-foot 6 inch interurban buffet car. Represented by H. C. Ebert.

Clarke Automatic Fender Company, Decatur, Ill.—Building 6, Section C, Space 4.—Clarke automatic fender, protruding and non-protruding. Represented by Ira P. Clarke.

Cleveland Frog & Crossing Company, Cleveland.—Building 2, Section C, Space 7-8-9.—Mate switch and frog; hard insertion —, Space 10.—Linotape, fish paper, tarpon paper, cotspring frog sample rail, also mechanism operating the derailing switch. Represented by Geo. Stanton, Geo. C. Lucas and E. D. Powell.

Climax Stock Guard Company, Chicago, Ill. and Canton, O. —Building 6, Section B, Space 15.—Climax "Clay" cattle guards, farm crossing gates. Represented by Fred V. Stewart and F. W. Stewart.

Columbia Machine Works & Malleable Iron Company, Brooklyn, N. Y.—Building 6, Sections 16-17, Space C.—Armature pinion puller, armature buggy, broom-filling table, snow-sweeper broom, babbitt moulds. Represented by John G. Buehler and W. R. Kerschner.

Consolidated Car Fender Company, Providence, R. I.—Building 4, Section A. Space 8-9.—Car fenders, snow brooms, car-step lifters. Represented by George Hollingsworth.

Consolidated Car Heating Company, New York—Building 4, Section C, Space 4-7.—Electric car heaters, portable vestibule heater, switches for electric heaters, switches for car lights,. switchboards. Represented by Cornell S. Hawley, S. Butler Keys W. S. Hammond, Jr., and F. W. Brownell.

Consolidated Engine Stop Company, New York—Building 6, Section B, Space 2.—Monarch system of automatic devices, consisting of engine stops, for steam, gas or oil engines, steam turbines and water wheels, engine stop operated by gravity, by steam pressure, also electric motor, automatic vacuum breakers, automatic safety breaker trips, automatic push switch, Monarch testing system for engine stops and automatic devices. Represented by Arnold W. Lenderoth and Harry W. Quackenbush.

Consumers Rubber Company, Cleveland, O.—Building 4, Section —, Space 10.—Linotape, fish paper, tarpon, paper, cotton tape, horn fibre and friction tapes. Represented by S. R. Driffield and F. N. Hitchings.

Cook Manufacturing Company, C. Lee, Louisville, Ky.—Building 6, Section C. Space 9.—Cook's metallic packing for piston rods and Corliss valve stems for both saturated and superheated steam. Represented by C. Lee Cook and Robert C. Baldwin.

Cook's Railway Appliance Company, Kalamazoo, Mich.—Building 4, Section A, Spaces 14-15.—Standard track and car, automatic lowering jacks, cattle guards, rail drills, tool grinders. Represented by Harry W. Russell and Eugene Cook.

Cooper-Hewitt Electric Company—See Westinghouse.

Creaghead Engineering Company, The, Cincinnati, O.—Building 1, Section C, Spaces 10-11-12.—Creaghead flexible brackets, Creaghead day and night car signs, Bourbon strain insulators, trolley-line materials, pole line fittings, glass porcelain insulators, Creaghead high-tension insulator pins. Represented by T. J. Creaghead and C. Johnson.

Crouse-Hinds Company, Syracuse, N. Y.—Building 6, Section B, Space 10-11-12-13.—Imperial arc headlights and combination, arc and incandescent headlights, Syracuse changeable incandescent headlights, Harpoon guy anchors, Norbitt porcelain specialties, condulets. Represented by A. F. Hills, N. Shute, F. F. Skeel and C. M. Crofoot.

Curtain Supply Company, Chicago—Building 1. Section B, Space 10-11.—Curtains for closed cars equipped with Forsyth No. 86, Ring No. 88, eccentric Acme cable and Climax cable fixtures, also ring fixture No. 49, adapted for semi-convertible cars, curtains for open cars equipped with Acme, Climax and Forsyth cable fixtures and ring fixture with projecting pins and metal retaining strip. Represented by W. H. Forsyth, A. L. Whipple and R. F. Hayes.

Davis Pressed Steel Company, Wilmington, Del.—Building 6, Section B, Space 29.—Davis brake beam bar, solid truss, solid-truss brake beam with vertical strut, especially adapted to electric railway service, solid truss brake beam with 40-feet strut, solid-truss high-speed-brake beam. Represented by W C. DuComb, Jr.

Dayton Manufacturing Company, The, Dayton, O.—Building 3, Section B, Space 1.—Car trimmings, brake handles, arc headlights, sash locks, incandescent headlights. Simmons-Moore Sander. Represented by John Kirby, Jr., Nelson Emmons, Jr., Peter Leidenger, Geo. W. Frost and Ed. L. Spencer.

Dearborn Drug and Chemical Works, Chicago, Ill.—Building 4, Section A, Space 12-13.—Water purifying preparations, lubricating oils and greases. Represented by Robt. F. Carr, Grant W. Spear, Dan Delaney, Paul T. Payne and W O. Clark.

Dixon Crucible Company, Joseph, Jersey City, N. J.—Building 4, Section C. Spaces 19-20.—Silica-graphite paint, pipe-joint compound, American graphite pencils, commutator compound, Ticonderoga flake graphite lubricants, graphite greases, plumbago crucibles, foundry facings, motor brushes. Represented by Charles H. Spotts, F. R. Brandon and L. H. Snyder.

Dossert & Company, New York—Building 3, Section A, Space 8.—Solderless connectors or mechanical splicing joints for electrical wires and cables; tap joints, terminal lugs, motor leads, rail bonds, meter connections, transformer connections, grounding devices, three-way, fourway and wye connectors; flat or front lugs, center or back lugs, service box plugs, insulated connectors. Represented by Harry B. Logan and E. A. Dossert.

Duff Manufacturing Company, The, Allegheny, Pa.—Building 1, Section A, Space 9.—Barrett lever jacks, including trip jacks, automatic lowering jacks and geared ratchet jacks. Barrett motor armature lifts, Duff rollerbearing screw jacks, Duff cone bearing screw jacks, traversing jack bases. Represented by Geo. A. Edgin.

Duplicate Transfer & Rebate Company, Philadelphia, Pa.—Building 1, Section B, Space 9.—Secret service work. Represented by H. N. Brown, T. C. Cary and Chas. Goble.

D. & W. Fuse Company, Providence, R. I.—Building 4, Section B, Space 10.—Deltabeston magnet wire, enclosed cartridge fuses, enclosed fuse cut-outs and boxes. Represented by W. S. Sisson and C. E. Harmon.

Earll, Charles I., New York—Building 3, Section B, Space 8. —Trolley retrievers. Represented by C. I. Earll, C. A. Coutan and E. Miller.

Eclipse Railway Supply Company, Cleveland, O.—Building 3, Section B, Spaces 21-22.—Car fenders. Represented by Martyn Bonnell, Ross Forward and Benj. Lev.

Edwards Company, O. M., Syracuse, N. Y.—Building 1, Section C, Spaces 5-6-7.—Models showing 25 designs of window fixtures and 9 designs of extension trap-door fixtures, exhibit of tin barrel spring rollers, sash balances and window fixture hardware. Represented by G. E. Bake, Edward F. Chaffee, O. M. Edwards, Franklyn M. Nicholl and Geo. G. Norris.

Electric Railway Improvement Company, Cleveland, O.—Building 6, Section A, Space 17.—Bond-welding car, motor-power grinder. Represented by C. L. Cadle and J. A. Cadle.

Elliott Bros. Electric Company, Cleveland—Building 4, Section B, Space 25½.—Field coils, armature coils, commutators. Represented by W. H. Elliott and A. S. Elliott.

Electrical Review, New York—Building 4, Section A, Space 17½.—Copies of the publication. Represented by Charles W. Price, A. A. Gray and Stephen H. Goddard.

Electric Railway Review—See Wilson Company.

Electric Service Supplies Company, Philadelphia, Pa., Keokuk, Ia., Chicago, Ill.—Building 1, Section A, Spaces 13-21.—Protected rail bonds, rail-bond compressors, Keystone overhead insulation, Keystone ears, Lyon sheetsteel gear cases, automotoneers, Garton-Daniels lightning arresters, pole brackets and fittings, third-rail insulators, Keystone car-vestibule shades, Mayer & Englund telephones, Keystone cable racks, Philadelphia car fenders, Brady bearings, sweeper rattan, testing instruments, construction and linemen's tools, high-tension malleable pins, portable lamp guards. Represented by C. J. Mayer, A. H. Englund, J. W. Porter, M. A. Berg, J. V. E. Titus, H. G. Lewis, John McSorley, William A. Armstrong, F. B. Massey, Benj. Hayller, Jr., Robt. Montgomery, James Stuart, E. R. Mason, John M. Gallagher, W. P. Cosper, Edward Hammett, Henry R. Swartley, Jr., G. E. Watts, Ernest Boehme, H. L. Adams,, Jos. B. Noros, C. H. Bristol and S. F. Alden.

Electric Storage Battery Company, The, Philadelphia, Pa.—Building 1, Section C, Space 17-18-19.—Two type R-cells, one containing 55 plates, the other 83, carbon regulator, compensating hydrometer, signaling hydrometer, recording hydrometer, automatic cell filler, several Manchester positive and box negative plates mounted on boards. Represented by C. Blizzard, H. B. Gay and G. H. Atkins.

Fay, J. A., & Egan Company, Cincinnati—Building 6, Section A, Space 10.—Hollow chisel mortiser, special square column band saw, both electrically driven. Represented by Jas. J. Sexton and Clifford P. Egan.

Felt & Tarant Manufacturing Company, Chicago, Ill.—Building 4, Section C, Space 14.—Latest model "1907 Improved" Duplex comptometer. Represented by L. A. de Berard, J. B. Cooper, C. C. Baum and Walter E. Zehring.

Flexible Mesh Rail Bond Company, Ypsilanti, Mich.—Build-4, Section B, Space 11.—Flexible mesh and rail bonds. Represented by J. G. Clark and J. L. Matson.

Franklin Car Heating Company, Syracuse, N. Y.—Building 4, Section B, Space 29-30.—Numbers 2 and 3 water jacket car heaters, and numbers 4, 4-A and 5, air jacket car heaters; The Franklin Car Heating Company also has an exhibit in the Machinery Hall next to the Niles car. In this is shown in operation a pneumatic trolley retriever which was in use during the winter on the Columbus London & Springfield Railway. Represented by Kenneth D. Hequembourg, E. S. Caylor, R. H. Carroll and Charles Reed.

Franklin Electric Manufacturing Company, Hartford, Conn.—Building 4, Section B, Space 30.—Vibration test of the Franklin street railway lamps, standard, reflector and miniature lamps. Represented by P. S. Klees, C. N. Thorpe, C. Leonard and F. E. Wilson.

Galena-Signal Oil Company, Franklin, Pa.—Building 4, Section A, Space 1-2-3.—Samples of lubricating oils. Represented by L. G. Miller, George A. Barnes, Edwin H. Baker, E. G. Beatty, S. J. Drake, John C. Glair, Alfred Green, J. E. Hall, H. C. Mason, J. S. Patterson, C. A. Record, George J. Smith, J. V. Smith, W. A. Stieff, C. E. Schauffler, C. H. Thomas, W. A. Trubee, William J. Walsh, William P. Wescott, E. B. Wilson, J. S. Seeley and Geo. L. Morton.

W. R. Garton Company, Chicago, Ill.—Building 3, Section B, Space 24.—Railway supplies including porcelain high-tension insulators, gears and pinions, assembled commutator bars, armature and field coils, tape, insulating compounds, telephones, insulator pins and brackets, overhead material, rail bonds, lightning arresters and ground or guy anchors. Represented by W. R. Garton, C. C. Ewing, L. E. Berebaum and H. M. Kennedy.

General Electric Company, Schenectady, N. Y.—Building 3, Section A, Space 11-19.—Quadruple GEA 605 single phase car equipment complete with type "M" control for operation on DC-AC circuits, mounted on frame and representing the under side of a car body, complete emergency straight-air brake equipment for motor car and similar equipment for trail car mounted on rack and operated together, GE-100 railway motor; GE-80 railway motor, operating exhibit of K28 and "F" controller arranged to show operation of contractors on rack, mercury arc rectifier outfit complete and operating incandescent lighting circuits of the exhibit space, portable air compressor outfit with CP-22 compressor, full exhibit of latest type catenary and standard direct-current overhead line railway material, new type high-candlepower Gem units and tantalum lamps, standard railway supplies and line materials. Represented by J. R. Lovejoy, W. J. Clark, J. G. Barry, C. C. Pierce, G. D. Rosenthal, A. B. Shepard, H. L. Monroe, R. E. Moore, E. H. Ginn, H. H. Crowell, F. A. Larkin, C. E. Barry, H. N. Ransom, E. D. Priest, A. H. Armstrong, W. G. Carey, F. E. Case and F. H. Gale.

General Systems Company, Dayton, O.—Building 3, Section B, Space 28.—Egry system of train dispatching, Egry system of railway way-billing special systems devised for use in the operating, constructing and maintenance of the various departments of railway service. Represented by Milton C. Stern, William L. Egry and James Josephi.

Gibbs Counting Machine Company, Zanesville, O.—Building 1, Section B, Space 22.—Counting machines for railroad offices. Represented by John C. Sullivan and W. A. Gibbs.

Globe Ticket Company, Philadelphia—Building 1, Section B, Space 8.—Street and interurban railway tickets and transfers, "Globe" power ticket destroyer in operation. Represented by W. C. Pope, P. C. Snow, R. C. Osman and W. P. Snow.

Gold Car Heating & Lighting Company—Building 4, Section A, Spaces 5-6-7.—Gold's improved electric heaters for car heating and other purposes, panel heaters, riser-board heaters, cross-seat heaters, temperature-regulating devices, systems of hot-water circulation for use in interurban cars. Represented by Edward E. Gold, John E. Ward, A. E. Robbins and F. A. Purdy.

Goldschmidt Thermit Company, New York—Building 1, Section A, Spaces 7-8.—Thermit and appliances used in welding; also rare metals made by the alumino-thermic process; daily demonstrations of compromise - joints. Represented by R. F. Kelker and George E. Pellissier.

Gould Storage Battery Company—Building 4, Section C, Space 18.—Various types of plates, including 49 plates, type U, in lead-lined tank; 19 plates, type S, in lead-lined tank; 21 plates, type O, in Appert glass tank; glass jars; also photographs of large installation for railway and lighting plants. Represented by R. H. Watson and J. E. Eipper.

Griffin Wheel Company, Chicago, Ill.—Building 2, Section D, Space 4.—Car wheels. Represented by Charles K. Knickerbocker.

Grip Nut Company, Chicago—Building 2, Section D, Space 3.—Grip lock nuts. Represented by B. F. Stewart, W. S. Wickerman and E. R. Hibbard.

F. P. Harrison Electric Manufacturing Company, Inc., N. Y.—Building 4, Section B, Space 10 1-2.—Deltabeston armature and field coils; also D. C. C. armature and field coils. Represented by F. P. Harrison and A. E. Meixell.

Hale & Kilburn Manufacturing Company, Philadelphia.—Building 4, Section B, Space 5.—Rattan in large rolls, also as a panel on three sides of exhibit, four styles of seats with pressed-steel seamless pedestals, small chairs used on private street cars and interurban cars, four steam railroad seats showing the latest design for street railroads which are similar but smaller. Represented by A. F. Old, H. T. Bigelow and S. A. Walker.

Harrison Safety Boiler Works, Philadelphia, Pa.—Building 6, Section B, Space 30.—Cochrane Feed-water heater, Cochrane separator, framed photographs of Cochrane heaters and separators. Represented by J. E. Harris.

Heany Fire Proof Wire Company, York, Pa.—Building 6, Section B, Space 14.—Heavy fire-proof insulated wire, armature field coils, and a demonstration of the ability of the insulation to withstand red heat indefinitely. Represented by Wm. H. Easton.

Heywood Brothers & Wakefield Company, Wakefield, Mass. and New York—Building 4, Section B, Space 2.—Interurban Wheeler car seat upholstered in green figured plush showing detachable back feature, Wheeler seat upholstered in rattan showing grab-handle and brass back-band, woven-rattan car-seat webbing, section of Wheeler mechanism operated by electric motor. Represented by Bertram Berry.

Home Rubber Company, Trenton, N. J.—Building 6, Section 5, Space 9.—N. B. O. sheet packing valves, hose and tubular gaskets; O. I. M. high and low diagonal rod packings, flax packings, hydraulic packing. Represented by Mr. A. R. Foley.

Indianapolis Switch & Frog Company, Springfield, O.—Building 2, Section D, Spaces 5-6.—Crossing of steam track with electric or interurban railway. Represented by W. H. Thomas and E. C. Price.

Indurated Fiber Company, Lockport, N. Y.—Building 3, Section B, Space —

International Fence & Fireproofing Company, The, Columbus, O.—Building 6, Section A, Space 6-7.—American Concrete Mixers. Represented by R. N. Cunningham, J. M. Campbell, L. W. Cargill, E. S. Dunham and J. W. McPherson.

International Register Company, Chicago—Building 1, Section B, Space 12-13.—Registers and register fittings, conductors' badges and punches, cotton trolley cord. Represented by John Benham, A. L. Tucker, Wm. G. Kirchhoff and A. N. Loper.

International Sprinkler Company, Philadelphia, Pa.—Building 1, Section C, Space 21.—Complete exhibit of the devices entering into the construction of an automatic sprinkler system. Represented by John C. Scott, A. B. Gould and A. M. Lewis.

Interurban Railway Journal, Indianapolis—Building 1, Section B, Space 2.—Volumes of the paper. Represented by Geo. W. Warmoth.

Jenkins Automatic Fender Company, Toronto—Building 6, Section A, Space 14.—Automatic fender. Represented by B. B. Jenkins, Jas. H. Jenkins and J. B. White.

Jewett Car Company, Newark, Ohio.—Machinery Hall—New semi-convertible car, one Brooklyn Rapid Transit car, one Winona Interurban 60-foot combination passenger and smoker. Represented by E. Besuden.

Johns-Manville Company, H. W., New York—Building 4, Section C, Space 1-2-3.—Overhead line material, third rail insulators, asbestos transite doors for transformers, "Noark" enclosed fuses, blocks, service and subway boxes, car cut-out boxes, electric car heaters, trolley wheels and brass goods, transite asbestos for fireproofing electric cars. Represented by J. W. Perry, R. R. Braggins, A. D. Newton, H. M. Voorhis, F. E. Johnson, J. W. Hardy and A. A. Forshee.

Jones & Laughlin Steel Company, Pittsburg, Pa.—Building 2, Section C, Space 3.—Cold-rolled axles. Represented by Elmer D. Batchelor, George B. Mitchell and C. H. L'Hommedieu.

Kalamazoo Railway Supply Company, Kalamazoo, Mich.—Building 1, Section C, Space 13-14-15-16.—Root railway spring snow scrapers, Root railway spring fender, tower hand car, pressed steel wheels, ratchet jacks, friction jacks, three different styles of Moore track drills, Smith curve lining gauge. Represented by H. G. Haines, F. N. Root, J. W. Thorn and D. A. Moore.

Keystone Brake Shoe Company, New York—Building 3, Section B, Space 18—Keystone brake shoes and heads. Represented by Charles H. Platt, V. B. Lamb and George M. Hoadley.

Kilbourne & Jacobs Manufacturing Company, Columbus, Ohio—Track near entrance to exposition building.—One class E dump car of 6 yards capacity, 1905 model, and one hopper bottom dump car of 6 yards capacity.

Kinnear Manufacturing Company, The, Columbus, O.—Building 3, Section B, Space 11.—Car-barn doors. Represented by E. H. McCloud, F. C. Schmidt, Henry G. Cox, S. R. Hewitt and H. E. Vance.

Kuhlman Car Company, Cleveland, O.—Machinery Hall—See J. G. Brill Company.

Lagonda Manufacturing Company, The, Springfield, O.—Building 1, Section B, Space 20-21.—Weinl and tube cleaners, both turbine and power-driven, Lagonda tube cutters, damper regulators, reseating machines, automatic cut-off valves. Represented by H. S. Bradley, H. F. Weinland, Hermon G. Weinland, Maurice Sellers and F. Stanley Davidson.

Lanning & Company, J. Frank, Pittsburg, Pa.—Building 6, Section C, Space 21.—Duplex combination headlight, Little Giant boring machine for babbitting, Chisholm & Moore chain hoists, F-M oil cups and Post's motor and Zero babbitt. Represented by J. Frank Lanning, C. E. Sommers, C. A. Schettler, N. C. Lane, J. W. Neefus, A. G. Maize and D. J. Lanning.

Liberty Bell Company, Bristol, Conn.—Building 3, Section B, Space 19.—Trolley harps, trolley wheels, bells. Represented by M. J. Horton and E. D. Rockwell.

Lorain Steel Company, The, Philadelphia, Pa.—Building 2, Section E, Space 1 to 7.—Special track work, girder and high tee rails. Represented by H. C. Evans, Carroll Burton, E. B. Entwisle, W. W. Kingston, A. S. Littlefield, S. P. McGough, F. J. Drake, S. P. S. Ellis, H. F. A. Kleinschmidt, H. B. Frye, Jr., R. Clitz, E. M. Fray and H. M. Millard.

Lord Company, George W., Philadelphia, Pa.—Building 4, Section B, Space 25.—Lord's boiler compounds. Represented by Edward McCarthy, Col. Nat P. Lane and V. O. Lawrence.

Lord Electric Company, Boston, Mass.—Building 3, Section B, Space 25.—Thomas soldered rail bonds, Shaw non-arcing lighting arresters. Represented by Edwin M. Hamlin, Geo. B. Crane and Geo. W. Smith.

Lumen Bearing Company, Buffalo, N. Y.—Building 2, Section D, Space 2.—Ideal trolley wheels, motor axle-bearings, truck bearings. Represented by E. P. Sharp and C. W. Stimpson.

Macdonald Ticket & Ticket Box Company, Cleveland, O.—Building 3, Section B, Space 2.—Macdonald cash receipt holder. Represented by Murdock Macdonald.

Magann Air Brake Company, Ltd., Detroit, Mich., and Toronto, Can.—Building 6, Section C, Space 12-13-14-15.—Motor and chain-driven tandem-compound air compressor with automatic starter and pressure regulator, floor framing of car with trucks, showing brakes in operation, automatic cut-off charging valve, hose couplings, rubber-seated ball check valve. Represented by W. K. Omick, F. Y. Harrison and Richard Kroll.

Maryland Steel Company, Sparrows Point, Md.—See Pennsylvania Steel Company.

Massachusetts Chemical Company, Walpole, Mass.—Building 4, Section B, Space 10½.—Insulating specialties; Armalac, special Armalac, M. C. No. 50 insulating compound, M. C. waterproof paints, enamelac, cable and transformer waxes, friction tapes and splicing compounds, M. C. weatherproof tape, rubber moulded specialties, field tape, field coil cushions. Represented by E. C. Green, A. T. Baldwin, R. T. Elwell, L. O. Duclos, A. E. Duclos.

Masury & Son, John W., New York, Chicago, St. Louis, Minneapolis.—Building 4, Section C, Space 8.—Panels decorated with seals of eleven states. Represented by T. J. Ronan and F. P. Hill.

Matthews & Brother, W. N., St. Louis, Mo.—Building 6, Section B, Space 18-19.—Stombaugh guy anchors, Kearney cable clamps, Lima jack boxes and plugs, O. K. sleet cutters, hold-fast lamp guards, Hargis cable-splicing joints. Represented by Claude L. Matthews and James R. Kearney.

McGraw Publishing Company, New York—Building 1, Section A, Space 1.—Technical books and bound volumes of its various publications, Street Railway Journal, Electrical World, and Engineering Record. Represented by James H. McGraw, J. M. Wakeman, H. W. Blake, C. B. Fairchild, Jr., Cail Gough, George S. Davis, H. B. Abbott, C. A. Babtiste, Frank Meyers, W. K. Beard, C. B. Walter, Jr., and C. J. Doyle.

McGuire-Cummings Manufacturing Company, Chicago—Machinery Hall.—One Romunder single-truck semi-convertible car, a McGuire snow sweeper, solid steel Columbian truck, one No. 39-A, short wheel-base truck, one No. 10-A-M. C. B.-type truck. Represented by John J. Cummings, W. J. Cooke and F. J. Ryan.

Miller Anchor Company, Norwalk, O.—Building 1, Section C, Space 20.—Miller anchors, augers and hollow stem tamping bars. Represented by G. H. Miller and F. B. Miller.

National Brake Company, Buffalo, N. Y.—Building 2, Section D, Space 16.—Peacock brakes in all different sizes and styles. Represented by G. S. Ackley, W. D. Brewster, F. D. Miller, W. W. Miller, J. A. Edwards and E. C. Rutherford.

National Brake & Electric Company, Milwaukee, Wis.—Building 3, Section C, Space 1-2-3.—Complete straight air-brake equipment, complete straight air-brake equipment with emergency feature, one new type air compressor, sectional air compressor, sectional slide valve, sectional emergency valve, supply parts for air-brake equipments. Represented by S. I. Wailes, J. T. Cunningham, J. E. Perry, W. H. Goble, W. M. Bisel, W. H. Beattys, Jr., W. R. Crawford, Bert Aikman, G. S. Hastings, R. P. Tell and Geo. S. Hastings.

National Carbon Company, Cleveland, O.—Building 4, Section C Space 13.—Carbon brushes, arc-light carbons, batteries and carbon specialties of all kinds. Represented by A. G Summerell, F. D. Kathe, N. C. Cotabish and J. F. Kerlin.

National Car Wheel Company, Pittsburg, Pa.—Building 2, Section D, Space 15—Steel-tired wheels with cast-iron centers and cast-iron wheels for electric railway service. Represented by E. H. Chapin, J. H. Yardley, J. D. Cunningham and J. F. Weisbrod.

National Lock Washer Company, Newark, N. J.—Building 1, Section B, Space 29.—Car window models showing operation of curtains equipped with National cam curtain fixture and National balance curtain fixture, with protected grooves, National sash locks, National sash balances and samples of National lock washers, plain nut locks and other patterns. Represented by F. B. Archibald, John B. Seymour, Daniel Hoyt.

National Ticket Company, Cleveland—Building 3, Section B, Space 2.—Different forms of tickets, canceling machines and turnstiles. Represented by A. J. Reynolds.

Newman Clock Company, Chicago—Building 6, Section A, Space 1.—Night watchman's clocks, employes time recorders, electric signaling clocks and other new time recording devices. Represented by A. A. Newman and C. E. Renshaw.

New York Switch & Crossing Company, Hoboken, N. J.—Building 6, Section A, Space 15-16.—Special track work. Represented by H. R. Sherman, Ernst Armerding and W. C. Wood.

Nernst Lamp Company—See Westinghouse.

Niles Car & Manufacturing Company, Niles, O.—Machinery Hall.—Two 67-foot cars for Columbus Delaware & Marion Railway, one 53-foot car for Aurora, Elgin & Chicago Railway. Represented by J. A. Hanna, F. A. Richards, F. C. Robbins, A. W. Schall.

Novelty Incandescent Lamp Company, Emporium and St. Marys, Pa.—Building 6, Section B, Space 17.—Elk new incandescent lamps, Novelty renewed incandescent lamps. Represented by R. K. Mickey and A. J. Jackson.

Nuttall Company, R. D., Pittsburg, Pa.—Building 1, Section A, Space 10-11.—Gears, pinions and trolleys for electric railway and industrial haulage service. Represented by F. A Estep, C. N. Wood, Geo. Provost, J. P. Provost, T. M. Cluley, R. M. Kerschner, J. S. Monroe, Max Berg and J. W. Porter.

Ohio Brass Company, Mansfield, O.—Building 1, Section B, Space 23-28.—Nichols-Lintern sanders, in operation on Christensen, Westinghouse and General Electric types of engineer's valves; Tomlinson car couplers; Aikman presure annunciators; Armstrong journal oilers, headlights, hose bridges, bell metal bearings, complete single-phase brackets, standard pole brackets, overhead material and all-wire rail bonds installed on rails and Lintern's electric marker and classification system. Represented by C. K. King, A. L. Wilkinson, A. B. Edes, A. L. Price, J. S. Hamlin, P. A. Hinds, E. F. Wickwire, J. E. Slimp, H. G. McDuffie, C. H. Tomlinson, N. M. Garland, S. H. Mattson, R. M. Campbell, F. H. Jameson, G. W. Cooper, A. L. Havens, G. A. Mead, W. H. Williams, F. S. Denneen, W. C. Starkey, C. E. Young and Wm. Lintern.

Ohmer Fare Register Company, Dayton, O.—Building 3, Section B, Space 12-13-14.—Various types of recording registers and operating devices and the Ohmergraph. Represented bv John F. Ohmer, J. H. Stedman, E. B. Grimes, W. J. Kuhns, W. E. Hinmon, C. V. Funk, Chas. W. Ketterman, Frank G. Colby and H. Tyler.

Oleson-Williams Company, Toledo, Ohio—Building 6, Section C, Space 19.—Lightning arresters for transmission lines. Represented by Albert Oleson, W. A. Williams and Charles C. Williams.

Oliver Machinery Company, Grand Rapids, Mich.—Building 3, Section —

Pantasote Leather Company, New York and Chicago—Building 1, Section B, Space 17.—Pantasote upholstery and car-curtain materials. Represented by J. M. High and D. E. Bonner.

Peerless Rubber Manufacturing Company, New York—Building 2, Section C, Space 14.—Perfected air-brake, steam and pneumatic tool hose, Rainbow sheet packing, Peerless Piston and valve-rod packing, Eclipse gaskets, trolley dodgers, rubber step mats, matting. Represented by G. S. Taylor and C. S. Prosser.

Pennsylvania Steel Company, Steelton, Pa., and Maryland Steel Company, Sparrows Point, Md.—Building 2, Section F, Space 1-7.—Tee and girder rails, special track work, tongue switches, mates, frogs, split switches, switch stands, crossings. Represented by H. F. Martin, Chas. S. Clark, John C. Jay, Jr., Richard Peters, R. C. Hoffman & Company, W. C. Cuntz, R. E. Belknap, J. G. Miller and H. B. Green.

Perry Side Bearing Company, Chicago—Building 6, Section C, Space 5.—Roller side bearings for steam and interurban cars. Represented by H. M. Perry.

Pittsburg Insulating Company, Pittsburg, Pa.—Building 1, Section A, Space 12.—Insulating cloths and papers. Represented by Phillip F. Norvell and Clifton F. Schmidt, Jr.

Pittsburg Steel Company, Pittsburg, Pa.—Building 6, Section A, Space 5. Electrically welded wire fence. Represented by E. Steytler and E. D. Findlay.

Pontius, W. H., Columbus, Ohio—Building 6, Section C, Space 7.—Safety shields for hand rails on cars. Represented by John M. Beckett.

Power Specialty Company, New York—Building 6, Section A, Space 9.—Foster Superheaters, Duval metallic packing, corrugated bronze gaskets. Represented by Alexander Bradley, Robert H. Wyld and S. H. Kay.

Pressed Steel Car Company, Pittsburg, Pa.—Building 1.—Electric steel passenger car. Represented by W. H. Wilkinson and P. M. Kling.

Quincy, Manchester, Sargent Company, Chicago, and Wallace Supply Company, Chicago—Building 4, Section B, Space 12-13.—Q. & C. Stanwood steps. Represented by Wesley Meeter, Burton R. Stare and C. Meterhausen.

Rail Joint Company, New York—Building 2, Section C, Space 10-13.—Standard T-rail joints of the continuous, Weber and Wolhaupter types, girder joints of the continuous and Weber types, insulated joints of the Weber and continuous types, compromise joints of the continuous type and continuous joints showing their use with the various types of bonds. Represented by B. M. Barr, E. A. Condit, Jr., D. J. Evans, G. M. Hager and W. T. Smettum.

Ramapo Iron Works, Hilburn, N. Y., and Niagara Falls, N. Y.—Building 2, Section C, Space 5-6.—Automatic return switch stands, split switches with patented solid-rolled steel riser plates, general track equipment. Represented by Arthur Gemunder and James B. Strong.

Recording Fare Register Company, New Haven, Conn.—Building 1, Section B, Space 8.—Recording fare registers of various types as well as simple fare registers, register rod and cord fittings, trolley wheels, trolley catchers, punches, conductors badges and buttons and general line of railway supplies. Represented by M. DeForest Yates, F. B. Kennedy and Charles N. Yates.

Ridlon Company, Frank, Boston, Mass.—Building 3, Section B, Space 27.—Armature coil taping machine, commutator stones, trolley wheels, Ridlon trolley catchers and retrievers, Kilbourn sanding devices, Ridlon & Weld babbitting devices, wire connectors, brass cleats and cable tags, car and register fittings, rail braces. Represented by Henry F. Kellogg.

Roebling's Sons Company, John A., Trenton, N. J.—Building 4, Section A, Space 18-19-20.—Practical exhibition of application of rail bonds, car cables, electric wires and cables, armature and field coils. Represented by H. L. Shippy, A. M. Whaley, G. R. Mitchell, W. W. Affleck, J. W. Brooks, A. B. Conover, Mr. Swartz, Mr. Henry and W. P. Bowman.

Ryerson & Son, Joseph T., Chicago, New York, Pittsburg—Building 3, Section B Space 20.—Working model of Continental boiler with Morison corrugated furnaces, Ryerson portable automatic key-seating machine, Simplex car and track jacks. Represented by E. T. Hendee and F. B. Slocum.

St. Louis Car Wheel Company, St. Louis, Mo.—Building 2, Section C, Space 2.—Chilled cast-iron street-car wheels (loose) for both local and interurban service, chilled cast-iron street-car wheels mounted on axles for interurban service. Represented by John W. Nute, W. W. Talman and F. O. Grayson.

Security Register and Manufacturing Company, Building 4, Section B, Space 6.—Fare register with clock-faced numerals, double and single recording. Represented by Giles S. Allison and Daniel J. Fitch.

Sherwin-Williams Company, Cleveland, Chicago, Montreal, Newark, London—Building 4, Section A, Space 31-32-33-34.—High-potential testing machines showing practice tests of insulating varnishes, exhibit of panels showing standard colors used by leading railways, car-side exhibit showing the various coats as applied in Sherwin-Williams system of car painting, varnish exhibit, handcraft stain exhibit, pole paint exhibit, rattan seat exhibit. Represented by G. A. Jacobs, H. E. Billau and E. M. Williams.

Sjoberg & Company, J. P., New York—Building 3, Section B, Space 7. Patent car vestibules and sash springs. Represented by J. P. Sjoberg and C. F. Sjoberg.

Smith, Peter, Heater Company, Detroit, Mich.—Building 4, Section B, Space 11.—Hot-water heaters for electric cars. Represented by Peter Smith, Elmer J. Smith and Daniel W. Smith.

Southern Exchange Company, The, New York—Building 4, Section A, Space 16-17.—Southern white cedar poles, long leaf yellow pine octagonal and square poles, Georgia long leaf pine crossarms, insulator pins. Represented by E. G. Chamberlin and Walter E. Mitchell.

Speer Carbon Company, St. Marys, Pa.—Building 1, Section B, Space 14.—Generator and motor carbon brushes and carbon specialties. Represented by J. S. Speer and G. P. Fryling.

Sprague Electric Company, New York—Building 4, Section C, Space 13.—Flexible steel armored hose. Represented by W. Almon Treal and Findlay Douglass.

Standard Brake Shoe Company, Aurora, Ill.—Building 2, Section D, Space 7.—Steel-back brakeshoes, composition-inserted shoes, coil-inserted shoes, Congdon shoes, plain shoes of special brakeshoe mixture. Represented by C. P. Wright, F. C. Peck and F. P. Collier.

Standard Motor Truck Company, Pittsburg, Pa.—Building 2, Section D, Space 11-12-13-14.—Standard C-35 single truck, Standard O-50 double truck, Standard C-60A. double truck. Represented by A. W. Field and W. G. Price.

Standard Paint Company, The, New York.—Building 4, Section B. Space 18-19.—P. & B. tape, electrical compound and insulating varnishes, Ruberoid roofing. Represented by H. W. Benedict, John H. Thomas, J. H. Vail, F. P. Barker and H. H. Cowherd.

Standard Steel Works, Philadelphia, Pa.—Building 1, Section A, Space 5-6.—Steel tires, rolled steel wheels, M. C. B. section, rolled steel wheels section cut out, rolled steel wheels interurban section, rolled steel wheels urban section, cast iron centre steel tired wheel M. C. B., section cast iron center steel wheel interurban section and cast iron center tired wheel urban section, M. C. B., motor axle, etchings illustrating cross sections of tire and rolled wheel electric truck for the Ocean Shore Railway Company. Represented by Frank Carpenter, H. W. Sheldon, C. H. Peterson, Oliver Bamford and E. S. Lewis.

Standard Varnish Works, New York—Building 4, Section B, Space 3.—Sections of field and transformer coils impregnated under vacuum with solid insulating compounds; solid compounds, both oil and waterproof, for use in connection with vacuum impregnating apparatus, voltalac and insulating varnishes. Represented by J. C. Dolph, L. Robinson, F. A. Elmquist, W. W. Sachler, H. B. Chicote and Edwin M. Heckscher.

Star Brass Works, Kalamazoo, Mich.—Building 1, Section B, Space 15.—Trolley wheels and trolley harps. Represented by O. P. Johnson.

State Manufacturing Company, Cleveland.—Building 6, Section C, Space 1-2.—"Metla-Cota" a preparation for painting and coating the interior of water tubes and steam boilers. Represented by G. A. Bethel and John McDonald.

Stephenson Car Company, Eliabeth, N. J.—Machinery Hall.—See J. G. Brill Company.

Sterling-Meaker Company, Newark, N. J.—Building 1, Section C, Space 15-16-17.—"The Five Modern Registers," Sterling patent center ringing device, rebuilt registers, Sterling safety brake, Giant brake, Sterling trolley base, Sterling fender, Sterling sandbox, Brostiom detachable handles, Sterling register fittings, conductors' punches, register and trolley cord. Represented by George E. Willis, Jerry M. Hayes and Franklin D. Willis.

Sterling Varnish Company, Pittsburg, Pa.—Building 1, Section A, Space 12.—Insulating compounds. Represented by S. C. Schenck, W. V. Whitfield, C. L. Cool, A. S. King and Chas. A. Barker.

Street Railway Journal—See McGraw Publishing Company.

Sutphen, C. H., Columbus.—Building 6, Section A, Space 12—Fire extinguishers used in coaches and chemical engines for power plants. Represented by C. H. Sutphen.

Symington Company, T. H., Baltimore, Md.—Building 2, Section C, Space 4.—Symington journal boxes for standard M. C. B. electric trucks of various designs, special journal boxes for special conditions, Baltimore ball-bearing center and side-bearings for electric service. Represented by E. H. Symington, W. W. Rosser, Carll Tucker, C. J. Symington, Jack F. Symington and D. Symington

Taylor Electric Truck Company, Troy N. Y.—Building 1, Section B, Spaces 3-7.—Single truck, S. B. swing motion double truck, H. L. B. swing motion double truck, M. C. B. type double truck, M. C. B. triple spring double truck, coil and elliptic springs for electric trucks of all types and makes and new design of steel-tired wheel. Represented by John Taylor, C. H. Dodge, Thomas Thorns and Walter Taylor.

Trolley Supply Company, Canton, Ohio—Building 4, Section B, Space 20.—Knutson trolley retriever, American catcher, Climax combination arc and incandescent headlight, Climax plain arc headlight, Globe dash headlight. Represented by J. E. McLain, J. Hollis and E. Rhoads.

United Copper Company—Building 6, Section C, Space 19.

United Indurated Fibre Co., Lockport, N. Y.—Building 3, Sec-Building 3, Section B.—Fiber insulation for all styles of third rail systems. Represented by William H. Baker,

United States Electric Signal Company, West Newton, Mass.—Building 6, Section C, Space 11.—Automatic block signal for electric railways. Represented by John J. Ruddick.

United States Engineering Company, Philadelphia, Pa.—Building 1, Section B, Space 30.—Nachod automatic signal. Represented by Carl P. Nachod.

United States Metal and Manufacturing Company, New York—Building 1, Section C, Space 9.—Perfect car replacers, Victor car replacers, Columbia lock nuts. Represented by B. A. Hegeman, Jr., Fred Atwater and F. C. Dunham.

Van Dorn Company, W. T., Chicago, Ill.—Building 3, Section B, Space 26.—Automatic car couplings, draft riggings, model of steel box-car. Represented by W. T. Van Dorn and John Sjoquist.

Van Dorn & Dutton Company, Van Dorn Elliott Electric Company, Cleveland, O.—Building 2, Section D, Space 1.—Gears and pinions. Represented by J. N. Elliott, H. L. Schneider and C. I. Cartwright.

J. H. Wagenhorst & Company, Youngstown, O.—Building 6, Section B, Space 6.—Machine for making blue prints by electricity. Represented by J. H. Wagenhorst, Donald Parson, E. Blake.

Wallace Supply Company, Chicago and New York—Building 4, Section B, Space 12-13.—Wallace double-door fixtures, Stanwood steel steps, steel gongs, automatic couplers, draft rigging, bending tools (hand power). Represented by Wesley Meeteer, Carl Merterharsen and Burton R. Stare.

Watson-Stillman Company, New York and Chicago—Building 4, Section C, Space 11-12.—Hydraulic railroad tools. Represented by Edward A. Johnson.

Westinghouse Companies, Pittsburg—Building 3, Section C, Space 4-19.—The apparatus displayed is that made by the Westinghouse Air Brake Company, Westinghouse Traction Brake Company, Westinghouse Automatic Air & Steam Coupler Company, American Brake Company, Westinghouse Electric & Manufacturing Company, Nernst Lamp Company and Cooper-Hewitt Electric Company. The exhibit of the Westinghouse Air Brake Company and Westinghouse Traction Brake companies is composed of air brakes for light and heavy surface traction, also air brakes for elevated, underground and interurban traction. They also exhibit a blowing outfit for commercial purposes. The exhibit of the Westinghouse Automatic Air & Steam Coupler Company consists of a working model of the automatic air and steam coupler. The American Brake Company's exhibit consists of various styles and sizes of brake slack adjusters. The Westinghouse Electric & Manufacturing Company shows in operation a set of Westinghouse electro-pneumatic control, operating two No. 121 motors mounted in their trucks. The set also operates two motors mounted on one shaft and arranged with prony brake, such as is used in factory tests. Display is made of stationary and portable instruments, wattmeters, voltmeters, ammeters, power factor meters, various kinds and sizes of both desk and ceiling fans; different designs of copper arc lamps; A. C. and D. C. railway motors of different horse power; high tension line material; also a number of separate armatures, fields and motor parts. The exhibit is lighted by Nernst lamps and Cooper-Hewitt lamp. Represented by—For the Westinghouse Electric & Manufacturing Company: R. W. Beebe, J. A. Brett, R. S. Brown, L. M. Cargo, Wm. Clegg, W. L. Conwell, C. S. Cook, Thomas Cooper, W. Cooper, H. P. Davis, J. L. Davis, G. B. Dusinberre, W. F. Fowler, Guy H. Gibbs, J. J. Gibson, J. R. Gordon, S. J. Keese, S. M. Kintner, J. C. Kyle, W. M. McFarland, H. C. Marsh, C. F. Medbury, W. E. Parker, D. D. Pendleton, T. S. Perkins, C. S. Powell, C. W. Register, F. F. Rohrer, F. H. Shepard, O. T. Smith, H. C. Stier, N. W. Storer, T. Varney, J. E. Webster, and G. B. Griffin. Westinghouse Air Brake Company: G. W. Baker, W. S. Bartholemew, R. H. Blackall, Robert Burgess, C. P. Cass, H. S. Clark, E. A. Craig, E. H. Dewson, C. R. Ellicott, Jos. R. Ellicott, F. V. Green, A L. Humphrey, S. D. Hutchins, A. Johnson, John F. Miller, F. M. Nellis, C. J. Olmstead, C. W. Townsend and W. V. Turner. Westinghouse Machine Company: John B. Allen, J. H. Wagonhorst, Edwin Yawger and H. D. Watson. Nernst Lamp Company, James L. Anderson. Representing joint interests: J. C. McQuiston and F. S. Smith.

Western Electric Company, Chicago and New York.—Building 4, Section B, Space 21.—General railway material, Electrose Manufacturing Company's line. Represented by Fred R. Babcock, W. L. Stockton, D. C. Guest, E. A. Burrows, F. D. Killion, R. H. Harper, L. T. Milnor, C. A. S. Howlett and H. Walton Heegstra.

Wheel Truing Brake Shoe Company, Detroit, Mich.—Building 1, Section B, Space 16.—Abrasive brakeshoes. Represented by J. M. Griffin and F. F. Griffin.

William Wharton, Jr. & Company, Philadelphia, Pa.—Building 2, Section B, Space 1-7.—Manganese steel special track work of improved types, including switches, mates and frogs of "Easy Renewable" center construction, H. T. switches, both in girder and T-rail solid manganese steel girder-rail tongue switch, solid manganese steel tongue switches, mates and frogs of T-rail construction, Dunham spring throws and switch locks, Wharton unbroken main-line switch for trolley road; manganese steel funnel castings for bridge guides, manganese steel center steam crossings, manganese steel split switch, ground throws and switch stands as well as models of the Wharton switch for steam roads, U. M. L. derailing switch for street railways; section of a frog of "Easy Renewable" center construction, butt end of an H. T. switch, showing construction of same besides enlarged photographs and black and white prints showing work furnished, worn manganese frog that has been in use in Broad Street Station, Pennsylvania railroad for six years. Represented by Wm. Wharton, Jr., L. R. Ashburst, Jr., J. C. Robinson, A. S. Partridge, J. B. Robinson, W. H. McDermott, Victor Angerer, R. C. McCloy, James W. Stringfellow, George R. Lyman, W. McLain and T. L. Hanley.

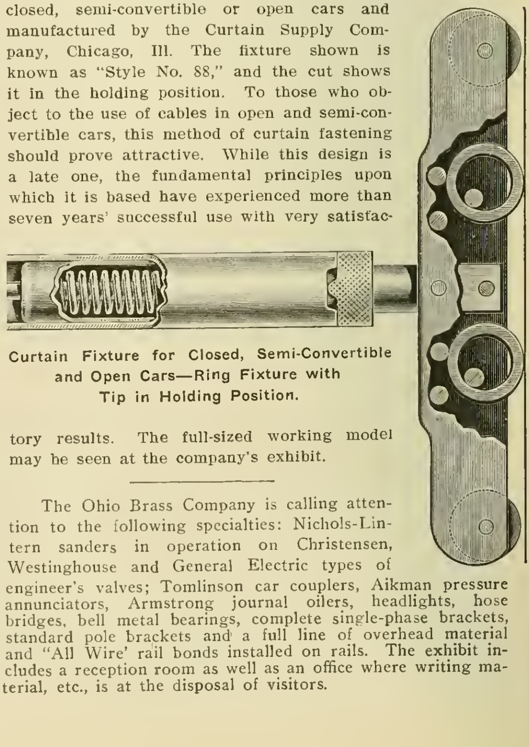
Wilson Company, The, Chicago.—Building 1, Section C, Space 3-4.—A daily edition of the Electric Railway Review reporting the proceedings of the conventions. Represented by Hugh M. Wilson, Francis W. Lane, Daniel Royse, William Forsyth, L. E. Gould, John N. Reynolds, J. Boyd, Frank S Dinsmore, Louis Pelletier, William Padget, E. J. Hunt, J. N. Nind Jr., Harold F. Lane, C. R. Mills, H. K. Stroud, J. A. Kucera, F. J. Phelps and C. Smith.

Wilson, Jas. G., Manufacturing Company, New York—Building 6, Section B, Space 7.—Rolling steel doors, rolling wood doors, sliding swing doors. Represented by A. H. Dodge, Percy H. Wilson and Lester G. Wilson.

Yale & Towne Manufacturing Company. New York.—Building 3, Section A, Space 6 and 7.—Electric hoists, chain blocks and trolleys. Represented by H. E. Dickerman and C. W. Beaver.

CURTAIN FIXTURES FOR CLOSED, SEMI-CONVERTIBLE AND OPEN CARS.

The accompanying illustration is a cut-away view showing a thoroughly-tested design of curtain fixture suitable for use on closed, semi-convertible or open cars and manufactured by the Curtain Supply Company, Chicago, Ill. The fixture shown is known as "Style No. 88," and the cut shows it in the holding position. To those who object to the use of cables in open and semi-convertible cars, this method of curtain fastening should prove attractive. While this design is a late one, the fundamental principles upon which it is based have experienced more than seven years' successful use with very satisfactory results. The full-sized working model may be seen at the company's exhibit.



Curtain Fixture for Closed, Semi-Convertible and Open Cars—Ring Fixture with Tip in Holding Position.

The Ohio Brass Company is calling attention to the following specialties: Nichols-Lintern sanders in operation on Christensen, Westinghouse and General Electric types of engineer's valves; Tomlinson car couplers, Aikman pressure annunciators, Armstrong journal oilers, headlights, hose bridges, bell metal bearings, complete single-phase brackets, standard pole brackets and a full line of overhead material and "All Wire' rail bonds installed on rails. The exhibit includes a reception room as well as an office where writing material, etc., is at the disposal of visitors.

Electric Railway Review
· DAILY EDITION ·

PUBLISHED BY THE WILSON COMPANY
at Columbus, O., in honor of the Annual Conventions of the American Street and Interurban Railway
Association and of its allied associations of Accountants, Engineers, Claim Agents and Manufacturers

COLUMBUS: 83 North Third Street CHICAGO: 1660 Monadnock Block NEW YORK: 150 Nassau Street PITTSBURG: 510 Frick Building
Subscription Price, $1; Foreign, $3; Single Numbers, 10 cents. Application made for entry at Columbus, O., as Second-class matter

VOL. XVI COLUMBUS, O., OCTOBER 19, 1906 NO. 10e

Depreciation and Electric Railways.

The subject of "Depreciation" has received considerable attention at this convention. In the address of President Brockway before the Accountants' association on Tuesday several paragraphs were devoted to explaining the plans of the Accountants' association as to the discussion of this subject which was proposed for this meeting. Inasmuch as there are but few electric railway companies in this country who have heretofore made a practice of providing for renewals through the creation of depreciation reserve funds, it was considered advisable to have the first discussion on this subject carried on in executive session, and on the Accountants' programme, therefore, it was arranged to devote the Thursday session of the Accountants' association to "Depreciation." At the opening session on Tuesday President Ely, of the American association, addressed the Accountants at some length, dwelling particularly in "Depreciation." This, we feel sure, is indicative of the fact that managers as well as accountants take a keen interest in this subject and that far more will be heard of it in the immediate future than has heretofore been the case. In view of this we feel it very proper to direct attention of all who are interested in this matter to the editorial on "Depreciation" which was published in the Electric Railway Review for August, 1906, page 452.

Population of Terminal Cities.

One of the matters discussed in the Question Box of the Accountants' association related to the extent to which residents of a large city forming the terminus of an interurban line should be counted for the purpose of calculating the per capita earnings of the line. Only four companies submitted answers to this, two suggesting that the proper method would be to include a portion only of the population of the large terminal, the proportion thus included depending on a number of factors, as, for instance, the character of the business of the community, whether manufacturing or not, etc. One company includes the total population of the terminal city and another reserves the right to do so. Mr. Guy Morrison Walker, in a recent address before the Sibley College of Engineering at Cornell University, cited an instance which throws a strong light on what is the conservative way of handling this question. Two interurban lines were considered; one was 40 miles long and purported to serve a population of 440,000 persons; its earnings were satisfactory in volume. A second line in nearby territory was 44 miles long and claimed to serve a population of 420,000. Very much to the surprise of all interested, the earnings of the second road, when it was completed, were only about half those of the first, and the ratio was maintained. When, upon investigation, it was discovered that in computing the population served, the larger terminal, with a population of 400,000, was included by both companies, the cause of the discrepancy of earnings became apparent. The road which had only 20,000 people outside of the terminal city to serve had only half the gross earnings of the one which had a population of 40,000 outside of the terminal city. In other words, the traffic which can be safely counted upon by an interurban line is that arising outside of the large terminal. The residents of the larger cities are not traveling to the smaller towns in search of amusement and only comparatively few of them have occasion to go on business, and therefore in preparing estimates on traffic which may be expected, the population of large terminals should not be included save in very exceptional cases.

Misconceived Standards of Comparison.

Considerable attention has been given by the Accountants' association to the subject of statistics and the extent to which the accounting department can aid the management in collecting, digesting and abstracting statistical information, and the best methods of presenting the results in order to make them readily intelligible to those who have possibly neither time, inclination or ability to study the statistics when presented in a less compact form. There are a great many items in connection with railway operation which permit of ready comparison by means of ratios and curves. Sometimes, however, a misdirected enthusiasm in the deduction of ratios results in choosing some that are not the best suited for the purpose intended. We have heard of an instance where the statistical bureau of a concern which operated a number of widely separated properties, and was naturally anxious to make various kinds of comparisons between them, showed among others the "ratio of wages of men employed in power house to number of pounds of coal burned." When one of the managers was called to headquarters to explain why the ratio of his company was so low, he answered it was impossible for him to reduce the amount of coal burned in his power plant, but, if the management insisted upon a higher ratio, he could secure that by an increase of wages.

Interurban Freight Service.

At the present stage of interurban railway development such a discussion as that which occurred yesterday morning upon the handling of freight is particularly valuable. The text upon which the discussion was based was a paper entitled "Interurban Freight and Express," by Mr. Edward C. Spring, general superintendent, Dayton Covington & Piqua Traction Company. Mr. Spring, without making the point that electric interurban railways should go into the freight and express business, nevertheless stated so many objections to this class of service that the tendency of the paper was decidedly towards discouraging this departure. He thought the word freight as applied to steam roads could not in its literal sense be applied to electric lines at the present day for the reason that doing freight business in its literal sense means the handling of freight in carload lots and trains. For this work the present equipment was not suitable and an interesting discussion arose upon this point. Mr. Hippee, Des Moines City Railway, gave an account of his road's experience in this work, the satisfactory nature of which is summed up by the fact that it had become much the more important part of the business and this position was substantiated with reference to another Iowa road by Mr. P. P. Crafts, operating an electric line between Clinton and Davenport, who said that by reason of a satisfactory traffic connection with the Chicago & Northwestern Railway they had nearly trebled their less than carload business for goods out of Davenport and had succeeded in running up freight car earnings to nearly 45 cents per car-mile. It was apparent from the discussion that service of this character could not be performed by the ordinary interurban road under generally present conditions. There would be difficulty in getting through various towns upon the line and any large increase over the service necessary in the passenger department would require extensive additions to power house, plant and equipment. Mr. Brinckerhoff said that he had met with one difficulty in this direction which was occasioned by the fact that interurban cars used for passenger service were geared to such high speeds that they were not suitable for hauling heavy loads. He suggested that if a few cars could be fitted with a different gear ratio it would be found that the maximum current consumption required in starting would not be so large, and consequently there would not be such serious fluctuations in the load upon the power station. The discussion as a whole was an exceedingly interesting one and indicated clearly that very many members of the association were seriously considering what should be done in the matter of handling freight and express, and also what arrangements could be made for interchange of traffic with the steam roads. In many instances the situation with reference to such arrangements appears to have ben summed up by an experience related by President Ely at a former meeting, in which he said that in endeavoring to make a traffic arrangement with the officials of steam roads he had been met with the glad hand and some cigars but no traffic arrangement.

INTERURBAN RAILWAYS.

In the extremely valuable paper on "Electric Railways In Sparsely Settled Communities," presented before the American association yesterday by Mr. E. P. Roberts of Cleveland, the author made a number of extremely important points and the facts which he adduced should receive careful study on the part of everyone interested in the development of interurban transportation. Mr. Roberts called attention to the fact that "sparsely settled" was a relative term and that the important point to ascertain when considering the advisability of constructing a proposed electric railway was not so much the actual population, as whether or not there were reasons for travel, and for travel at a satisfactory rate per passenger-mile. He also stated that in his opinion the population of the principal terminal city is of comparatively small importance provided that it is the principal city in the general section of the country in which the road is located, and, therefore, the point to which all traffic tends.

A considerable portion of the paper was devoted to statistics for interurban electric railways and to the proper and improper use of statistics. The method followed in obtaining the population tributary to the road was not based on the population within an arbitrary distance from the road, but included considerations of accessibility and comparative facilities, the intention being to obtain a figure termed "The equivalent population" which, if directly on the route, would be equivalent in earning capacity to the actual population as actually distributed. Mr. Roberts gave a curve and table showing the results obtained by a number of interurban electric railways and described an effort to obtain a formula based on population and the distribution of population, which would be of some value in connection with estimating probable earnings. He stated that no possible formula could fit all the results obtained, although one was found which did give results in accordance with the results obtained from a number of roads. A curve was presented illustrating the fact that income per capita increases as the population decreases. also a chart curve showing that receipts per mile have no fixed relation to population per mile. Mr. Roberts stated that he had made this investigation without expectation that a satisfactory formula would be obtained, but in response to a request from several persons who seemed to think that it would be reasonable to expect that possibly some approximate relation between population, distribution of population and income, might be ascertained. The author said great stress was laid upon the error of using averages or using figures obtained from one road, or from a number of roads, as being directly applicable to some other road. The error resulted because practically no two roads are entirely similar. In the paper the author divided electric railways into three general classes: city, suburban and interurban, describing the general character of cars and motor equipment suitable for the different classes of service, and calling attention to the inadvisability of gearing motors for a higher speed than that necessary to assure the maintenance of the required schedule; this applied especially to high gears on city and suburban cars.

Special attention was called to the fact that the success of a road depends upon obtaining the best location, proper design for the conditions, proper construction and competent operation. The first three are dependent upon the expert advisor and cannot readily be changed later. Moreover, the results obtainable by the most competent operation depend upon the skill displayed in choosing location, in designing and in building; also, incompetent operation can be changed.

ELECTRIC SERVICE OF ELEVATED RAILWAYS.

The heaviest business and most frequent service in the electric field is found on the elevated lines and the longest experience with heavy electric traction has also been on these lines. Several of the most important elevated roads were formerly operated by steam locomotives, and there is here favorable opportunity for a comparison of the service as to speed and density of traffic as well as the cost of operation by the two kinds of motors. In the paper on "Elevated Railways and Their Bearing on Heavy Electric Traction," by Mr. H. M. Brinckerhoff, read before the American Association Thursday morning, some interesting figures relating to this subject are presented and the author regards them as having more direct application to the economic questions involved in the electrification of steam lines than figures obtained from other classes of electric service.

The magnitude of the elevated electric line service in this country is indicated by the fact that during the year 1905, the elevated systems in Chicago, New York, Brooklyn and Boston, operated 170 million car-miles, carried 685 million passengers, and made gross earnings of over 34 million dollars. The Chicago & Oak Park Elevated was operated by steam locomotives in 1895, and was electrified eight years ago. A comparison of operating figures for 1895 and 1904 along this line shows that the passengers per car per annum increased 23 per cent, the cost per car-mile decreased 8.2 per cent and the schedule speed increased 22 per cent from 12.5 miles per hour, all these improvements being due to the electric service. On the South Side Elevated, Chicago, still greater improvements accompanied the change from steam to electricity. The passengers per car mile increased 52.6 per cent and the cost per car-mile decreased 16 per cent. On the Brooklyn Rapid Transit (elevated division) the schedule speed has been increased 37 per cent from 11.5 miles per hour, and the cost per car-mile slightly reduced by the substitution of electricity for steam. The figures for the Manhattan Elevated, showing the remarkable economy and improved schedules due to electrification, have been frequently referred to as a grand example of the benefits to be derived from the use of electric traction and we may quote some of the principal ones given in the paper referred to. The comparison is made between the steam year 1901 and electric year 1904. The number of passengers hauled increased 50 per cent, the schedule speed increased from 10 miles per hour to 15 miles per hour, or 50 per cent, and the cost per car-mile decreased 20.4 per cent. As examples of low cost per car-mile the figures on the Manhattan are given for 1904 as 9.5 cents, and for the Metropolitan West Side, Chicago, for 1905, 9.31 cents.

The great improvement in schedule speed at a reduced cost of operation, represents a larger economy than the figures indicate, as it is evident that the faster schedules are only obtained by a higher rate of acceleration which must be accompanied by a great increase in power consumption. The steam locomotive cannot economically compete in any attempt to approach the acceleration obtained by the electric motor, as the boiler and engine become too cumbersome and the expense for fuel must increase with the power consumption. For this reason the real gain due to electrification, if schedules had remained the same, would be indicated by a reduction of 25 to 30 per cent in cost of power alone.

Another advantage of electric traction which is pointed out in this paper is the greater efficiency of the equipment when the proportion of the time it is in service is considered. Thus on the Metropolitan Elevated, cars which performed a heavy service during 1905-1906 were available for service 97 per cent of the time. Motor cars average on this road 4500 miles per month, which is a higher figure than the average for steam locomotives, which may be taken at 75 per cent as the proportion of time they are available for service. Mr. Brinckerhoff concludes that aside from the question of economy, electric traction has the following advantages over steam operation: (1) An increased capacity per car unit due to greater availability for service and higher schedule speed. (2) An increased capacity for the system in general due to shorter intervals possible at terminals. (3) An increased earning capacity due to items (1) and (2) and to the more attractive service by reason of greater frequency of trains possible with economy, a cleaner and quieter service giving greater returns in larger proportion than the direct ratio of apparent increased facilities.

THE WAY OF THE ENGINEER IS HARD.

The Roberts & Abbott Company, of Cleveland, recently received the following well-deserved rebuke from a would-be client who very properly grew indignant when he was told that he would have to pay for professional advice in engineering matters:

"Your favor of recent date to hand. In reply will say that I see no way for us to do any business unless you come here and inspect the plants and this you say must be done at my expense. I cannot bear such expense and I feel sure owners of respective properties would object to doing so. The plants are for sale and if as described and submitted they do not offer such inducements for investigation on your part and at your own expense 'the incident is closed,' so far as I am concerned. Two companies (giving names) have in last three days had their men here to inspect the plants and both went away favorably impressed and assured me their companys would at once take up negotiations for them. I understand that there are still in existance a line of constructing companys which demand, as you do, expenses paid for work of experts, but they are burning their time in the face of enterprising companys only too anxious to catch an early train to places where good money is hung up for them. Your way is the way of the past when such companys had their pick and choice in such work, but in this wild and go ahead age, and when money goes on a light foot in search of investment, I fear yours will be found left in a well chosen hiding place.

"The West, Southwest and the South are the inviting fields for exploitation today, and it behooves those who would reap something of their rich harvests, and gather of their possessions, to kiss their folks in the East a good-bye for a while and venture among us, where they are sure to find welcome hands of a most hospitable, generous minded, and wide awake people. You would be surprised to come here and see what a beautiful city we have built where only a few years ago the tall prairie grasses waved in the winds and the wild herds browsed at their leisure. What a contrast it would show you to things so trite and moss-covered in your sections and where pennys are split to better serve the trade.

"With pardonable pride I mention these things for you to ponder over, and acknowledge, if you will, what a deal of bad luck you have experienced in not having this land of honey pointed out to you before.

"After reading this if you should care to strike out from the old roof, the dear old fireside, and come to see me, I will promise every courtesy and show you a thousand and one golden colors, and all manner of fleece so extant in our blessed country."

We are greatly gratified to see avarice thus "came up with." We hope this will have its effect in putting an end to the practice of demanding pay for services rendered—a practice which is much to be deprecated.

ANNUAL MEETING OF THE MANUFACTURERS' ASSOCIATION.

The annual meeting of the American Street and Interurban Railway Manufacturers' Association was held in Convention Hall at 4:30 p. m. yesterday. President McGraw presided in his usual businesslike way. After Secretary Keegan had called the roll and had read the minutes of the last annual meeting, President McGraw addressed the meeting briefly in a hasty review of the history of the reorganization of the association. In closing he called upon Vice-President John I. Beggs, of the American association. Mr. Beggs congratulated the manufacturers on the work they had done and the results they had achieved for the improvement and advancement of the art of urban and interurban transportation. He contended that the real value of these annual meetings to the railway men and their companies lay in the opportunity the exhibit of appliances afforded for instruction as to the latest developments in devices, machinery and methods. The report of the treasurer, Mr. E. H. Baker, showed that the finances of the organization are in a satisfactory state and that instead of a deficit, a substantial balance would be left at the close of the present convention. On motion of Mr. Harold P. Brown the executive committee was instructed to so arrange in succeeding years that the representatives of exhibitors who were compelled to reach the site of the convention five or ten days in advance may be given the benefit of the reduced rates of railway fare.

Under the by-laws of the association the terms of the following members of the executive committee expire with the present convention: Messrs. Charles C. Peirce, Edw. H. Baker, W. M. McFarland, J. W. Nute, Geo. J. Kobusch, Hugh M. Wilson. The election resulted in the selection of Major H. C. Evans, Lorain Steel Company; Charles C. Peirce, General Electric Company; A. H. Sisson, St. Louis Car Company; W. M. McFarland, Westinghouse Electric & Manufacturing Company, and K. D. Hequembourg, Franklin Car Heating Company, each for a term of three years, and Hugh M. Wilson, the Wilson Company, for a term of two years.

After adopting a resolution of thanks to the officers of the association and to the citizens and the Board of Trade of Columbus, the meeting adjourned.

CONVENTION PROGRAMME.

Friday, October 19.

American Association.

10 00 A. M. to 12 30 P. M. (Executive Session)

Report of Committee on Municipal Ownership.

Report of Committee on Public Relations.

Paper—"Handling Public Complaints," by John A. Beeler, Vice-President and General Manager, Denver City Tramway Company, Denver, Col.

Paper—"Leaks Between Passenger and Treasurer," by A. H. Stanley, General Superintendent, Public Service Corporation of New Jersey, Newark, N. J.

2 00 P. M. to 4 30 P. M.

Report of Nominating Committee.

Election of Officers.

Resolutions.

Unfinished Business.

Adjournment.

CONVENTIONALITIES

In the advance report of the Accountants' Question Box, an error was made, which was followed in the abstract published in the Review for October 18, 1906, page 797. In the summary of answers made to question 2, it was said that the American Railways Company had placed discount on bonds in "accrued liabilities, miscellaneous," in the balance sheet. The answer of this company in the corrected paper is the same as that given by the Montreal Street Railway Company, "current assets, miscellaneous."

Herr Heinrich See Pirrung was decorated last evening with a handsome convention badge, the number of which was "23," and also with another badge without a number which was a whited joke.

The delegates from the East St. Louis & Suburban Railway Company, St. Louis, Mo., consisting of G. C. Pierce, general superintendent; M. M. Lloyd. master mechanic and W. A. Bennett, engineer of maintenance of way, returned to their home last night. They declared before leaving that it was business rather than the bad weather of yesterday that caused them to leave before the closing day of the convention.

Mr. Citaro Sakuma, of Japan, who has been sent by the government of Japan to study the express business in this country, and by the Tokyo Consolidated Railway Company, to investigate street railway operation, is attending the convention and is viewing the exhibits with a great deal of interest.

Mr. Milton Rupert, assistant to the president of R. D. Mittal Company, arrived last night to attend the convention.

The Annual Banquet.

The annual banquet of the American Street & Interurban Railway Association at the Southern hotel last night was a success in every way. It was successful in point of attendance, the menu was good, the service excellent, the appointments were appropriate and reflected credit upon both the association and the local people, the speeches were able and bright and were enthusiastically received. Not the least of the glories of the occasion was the presence of a large number of ladies.

Mr. R. G. Hutchins, the chairman of the local reception committee presided as toastmaster and both his manner and his matter showed that he knew his men. The principal address was that on "The Electric Railway and the Municipality" by Hon. H. J. Booth, of Columbus. He discussed, with a wealth of facts at his command, the questions of municipal ownership and other present day socialistic tendencies. President Ely was happy and entertaining as usual on the theme "The Association and the Future." Mr. John Y. Bassell, of the Columbus Board of Trade was witty, forceful and passionate in his response to the sentiment, "Columbus and the Convention," while Mr. H. M. Daugherty, of Columbus, discoursed eloquently on "The Interurban Railway and the Commonwealth."

Dorsey's Dream in Colorado.

It appears that even the somewhat prosaic work of the claim agent has its streaks in which poetic license is invoked. This was exemplified on Wednesday afternoon at the closing meeting of the Claim Agents' association when Mr. Johnson, of Bridgeport, Conn., read the following, which was signed "Vories of the Pueblo and Suburban."

Claimants tell the truth—in sections,—
In Colorado.
Corporations hold a few elections,
In Colorado.
The climate is quite out of sight;
They kill men off most every night;
They have a friend and do him right,
In Colorado.

They dig the silver out by tons,
In Colorado;
And have to mine with loaded guns,
In Colorado.
The Unions sure are on the fight;
They blow folks up with dynamite.
The reason why we don't see quiet,
In Colorado.

Most every man has got a mine,
In Colorado,
He'd gladly sell to you on time,
In Colorado.
The melons are the sweetest,
The "peaches" are the peachiest,
And they say they are the fleetest,
In Colorado.

The women vote, the tramways fight,
In Colorado.
They stuff the ballot box all right,
In Colorado.
The claimants are most all the meanest;
'Bout payments are just sure the leanest,
Yet tramways are I'm sure the cleanest,
In Colorado.

Our telephones have got a cinch,
In Colorado.
The Beef Trust's always on the pinch,
In Colorado.
Excitement fills the sunny air,
There's something doing everywhere,
The whole blamed state is on a tear,
In Colorado.

The courts grant "high prerogative writs,"
In Colorado.
The common folks are "catching fits,"
In Colorado.
The people running quite pell-mell
Are giving corporations h——l,
And sulphur smoke you all can smell,
In Colorado.

They need the "dollar" contribution,
In Colorado,
To save the "bloomin' constitution"
In Colorado.
There's war and strife, and then some more,,
Unless there's fighting, life's a bore
And lots of trouble still in store,
In Colorado.

We've four candidates for Governor,
In Colorado;
And one of them's in jail,
In Colorado.
And Bryan, he's going to talk,
And says corporations all must walk,
The people there'll most likely balk,
In Colorado.

Mr. Hiram J. Kenfield, who for several years represented the Review in the East, has been a welcome visitor at the Electric Railway Review headquarters during the week. We understand that Mr. Kenfield is soon to launch a new weekly electric railway journal to be known as Traction News, with headquarters at Cleveland. The editorial department is to be under the direction of Mr. C. B. Fairchild, Jr., who was for several years eastern editor of the Street Railway Review, and more recently associate editor of the Street Railway Journal. Mr. George Davis, Cleveland representative of the Street Railway Journal, will, we understand, be associated with Mr. Fairchild in the editorial department. Traction News has our best wishes.

AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION.

The convention met pursuant to adjournment at 10 o'clock on Thursday and was called to order by President W. Caryl Ely.

The president said in reference to the report of the committee upon "Compensation for Carrying Mail," that Mr. Beggs, the chairman of the committee, had asked to be permitted to defer the presentation of that report until Friday.

The first order of business this morning was the report of the committee on "Heavy Electric Traction," and Mr. Calvert Townley, of the New York New Haven & Hartford, chairman of that committee, consented to say a few words concerning the report and the views of the committee, after the reading of the report.

Mr. Townley read the reports as it appears elsewhere.

At the conclusion of the reading of the formal report of the committee, Mr. Townley said that he was personally associated with interests which operate trolley roads of several different characters, and also who are interested in the electrification of roads that are now operating by steam, and he had been impressed with the fact that electric railroading and steam railroading are all in the same line of thought. It is all railroading. Steam railroad men had told him that the trolley was an insignificant and unimportant kind of railroading, and trolley men had told him that steam railroad men did not know anything about the trolley business as it was so totally different that there were no points of similarity at all. Of course there was ground for these extreme opinions in a measure, but he thought they were both wrong. It seemed to him that both the steam and trolley roads have so many points in common that it is much safer to class them together, and he was impressed with the possibility of development of electric traction, whereby the trolley roads instead of primarily competing with, would become feeders to the steam roads so that the two classes of transportation would be friendly and assist one another. He said there was no reason why this could not be done if the arbitrary conditions of ownership and competition could be removed.

It also seemed to him that, with specific reference to the matters that have been suggested for this committee—should the committee be continued as a standing committee—that in the practices of electric interurban lines steam conditions are so nearly approached, that if possible, advantage should be taken of the experience of steam roads in dealing with the problem. He did not know exactly how the proposition of making a dividing line between the ordinary trolley road and what may be called the heavy electric traction would be regarded. He thought such a line would be extremely difficult to draw and did not believe it should be drawn rigidly; but it was certain that the interests of the heavy inteurban service and the electrified steam service were going to be so closely identified with each other that cognizance could be taken of the fact with profit and careful attention given it.

It was then moved by Mr. H. C. Page, of Worcester, Mass., and seconded by Mr. Grant, that a vote of thanks be extended to this committee for the able and instructive manner in which it had handled this subject.

There was no discussion.

The next order of business was the paper, "Elevated Railways and their Bearing on Heavy Electric Traction," by H. M. Brunckerhoff, consulting engineer, New York City. Mr. Brinckerhoff read the report of the committee, which is given elsewhere.

There being no discussion the next paper, "Electric Railways in Sparsely Settled Communities," was presented by Mr. E. P. Roberts, of Cleveland. The paper appears elsewhere.

Mr. Roberts then said; by way of addition to the paper, that the value of the promoters' or "speculative" interest in a proposed electric railway was generally in stock, and, as the margin of profit was nearly always quite small, even though the gross income might be large, therefore, a quite small percentage difference in the amount of the gross and net receipts might, and frequently would, make such difference in the amount payable for dividends on stock as practically to determine whether or not the stock would have any value, and not unlikely, might be just the difference between paying interest on bonds or not quite meeting such interests, in which latter case the original speculative interests might be entirely wiped out by the process of reorganization. It was, therefore, very evident that, practically speaking, it was impossible to give too much time and expense to the preliminary investigations in order to insure that the location and design of the road was such as would give maximum dividends, considering the effect of variations of route on first cost, operating expense, and gross income, and the net income resulting from the foregoing considerations. It would be very easy to affect the gross income from five to fifteen per cent by changes in route, or by the character of terminal facilities, and such changes might be accompanied by a greater or less first cost, or greater or less operating expense, or both. He stated that this thought was based on a statement by Mr. A. M. Wellington in his classic book on "Economics of Railway Location." The writer believed that it would be of value to all interested in electric railways to read the introduction to that book, and also the general statements in Chapter 1, relative to "Economic Premises." As an introduction to such chapter Mr. Wellington gives the following quotation of D. H. Ainsworth: "The location of a railroad is giving it its constitution. It may be sick, even unto death, with accidents of construction and management, but, with a good constitution it will ultimately recover."

At the conclusion of the reading of Mr. Roberts' paper, the chair called for the next paper, which was "Interurban Freight and Express," by E. C. Spring, general manager, Dayton Covington & Piqua Traction Company, West Milton, O.

The Chair stated with regard to Mr. Clegg's paper, "Interurban Limited Trains," that by reason of illness in his family he had been continuously absent for a number of months and unable to furnish the paper.

Mr. Spring then read the paper as it appears elsewhere.

In the discussion Mr. George W. Parker, general freight, passenger and express agent, Detroit, Mich., asked Mr. Spring if he could tell just what his earnings per car per mile had been on handling freight business?

Mr. Spring said he had been unable to derive any authentic statistics on that subject. He had written to several roads asking them for this information but had been unable to get any statistics that he felt were anywhere authentic.

In the matter of personal experience Mr. Spring said that on one of the properties he was interested in at the present time they are not doing a heavy express business. He did not think he had any right to say, taking it from the heavy freight standpoint.

Mr. Parker said what he wanted to get was some information on earnings per car per mile.

Mr. Spring said he could not state from a heavy freight standpoint.

Mr. Parker also asked if Mr. Spring had as yet experienced any difficulty with the different municipalities on the handling of trail cars in cities?

Mr. Spring said he was meeting that everywhere.

Mr. Parker said that in Detroit he was confronted with that proposition. The city had adopted an ordinance which compelled the company to pay $1.00 per car per round trip for all freight cars operated in and out of the city, and that now amounted to $5,000 per year.

In addition to that trouble, the company also compelled by ordinance not to operate express cars oftener than every two hours. They had not been pushed hard on the last point, but it was an open question if some one would not take advantage of it. What he wanted to get at was, what in Mr. Spring's judgment, would be the future as to the attitude of the municipality toward interurban traffic so far as freight and express were concerned. He asked if Mr. Springer did not think that some municipalities would take the same course in the near future as he had outlined and especially would this not be true with reference to the handling of trail cars?

Mr. Spring said there was such a diversity of opinion between various municipalities, particularly in the state of Ohio, that it was hard to formulate any definite opinion on the subject, especially until such time as standardization of equipment was reached, so that cars could be taken from one road to another. As an illustration he referred to the bringing of one of the special cars into this city.

Mr. Spring said he did not speak with special reference to passengear cars; the same was true of freight and express cars; that the width of a freight car varied to a large extent. He had a freight car transferred to his road and it was impossible for them to get through the city on account of the dummy track. They could not pass the interurban car, and that car had to be handled outside of the city limits. Yet that car had been through a number of the larger cities and particularly the cities in the state of Indiana.

In the city of Dayton they were compelled to have a width of car there that is 8 feet 2 inches over-all, and a great many freight cars exceeded that. The same might be said of the passenger cars. That was why he said, as he had tried to make plain in the paper, that the handling of heavy freight, up to the present time, in a universal sense, he did not believe was expedient.

Mr. Ernest Gonzenbach, Sheboygan, Wis., said he represented only a very small road, but he had a small interurban line and up to two years ago the road had been doing a small amount of express and freight business and with one car was earning perhaps 20 cents per car per mile. Since that time they had been pushing the freight business and had succeeded to the extent that that car today is earning about 30 or 40 cents per mile, and in some months 45 cents per car per mile; whereas their regular passenger interurban cars were earning about 25 cents per car per mile. It seemed to him that earnings of that magnitude were not to be sneezed at. They had only one car but they handled very heavy shipments. They had gone in for the handling of cheese. The country is a great cheese producing country and during the month of September last he said that one car took in $727 gross in freight, at an operating cost of $254, an item of operating cost which was decidedly better than could be obtained in the passenger service.

Not only that, he added, but along the interurban road is a factory having an output of very heavy goods—plumbers supplies. They had switching facilities from the Chicago & Northwestern and were supposed to have an iron-clad contract with the Chicago & Northwestern not to do business with any other road, but the facilities offered by the electric road were such that the parties concerned undertook to get a release from the Chicago & Northwestern, allowing them to do business with the interurban line, and while the latter was carrying the business for 3¾ cents per hundred, the goods were so heavy and the traffic so regular and so large, that that business alone was netting about 45 cents per car per mile. He believed that Mr. Spring was in error about the amount of earnings to be derived from the freight business.

Mr. Spring said he did not quite understand the gentleman when he said that he was in error. Mr. Gonzenbach said he wanted to take issue with the statement that he did not believe in the future of the freight business.

Mr. Spring said he did not say that. That he did believe in it and the paper distinctly stated that. He believed that the possibilities were great, but did not believe that the possibilities would be shown until the road was in shape to handle the business.

Mr. Spring said to Mr. Gonzenbach that he could not take a train of fourteen cars off of a steam road and carry them to any point on his line with the present motors.

Mr. Gonzenbach admitted this but said if they had cars from which they were getting the results that he spoke of it would certainly show a handsome profit and he simply said that if he could get these results with one car, he would like very much to have fourteen cars or fourteen hundred cars on the same basis.

Mr. Soring said all would like to have them; but they would have to change their power stations to do it. That was what he meant by saying that it would be necessary to reconstruct not only the power stations but the track before freight in its most liberal sense could be handled.

Mr. G. B. Hippee, general manager Interurban and Des Moines City Railway, Des Moines, Ia., asked Mr. Spring if he could not handle a smaller train than fourteen cars? Could he not haul from four to eight freight cars in a train on the road with its present equipment?

Mr. Spring said he could not do it on his road.

Mr. Hippee replied that there were some roads that could do it. He said his company was handling car load freight and making an effort to get heavy car load freight in its business. He had a joint traffic arrangement with roads running to Chicago under which they would load a car load of cattle and the steam road would furnish the cars, or load a car load of corn and his road got 33⅓ per cent of the long haul. From a 60,000 pound load they would get $25 for hauling that car on an average of fifteen miles. They were striving for heavy business, and had been for the last three years. Their freight earnings started out, at first, at 13 per cent, or at about 13 per cent, when the road was new. They had just about completed the road now. Freight earnings, on that line, he said, had been about 40 per cent of the gross receipts, this year. They haul all the coal that is burned in the electric light station in Des Moines. This was the only road that went to the army post, and they had hauled every pound of the material that had gone into the building of that post. In the last three years that would represent about 8,000 cars. The company keep a regular freight department, and had men to go out soliciting business because there was money in this long haul business. That is what he was striving for. He said there was more money in the long haul business proportionately than in the short haul.

Mr. Spring thought there was not one road in ten equipped the same as Mr. Hippee's road to handle that kind of freight.

Mr. Hippee admitted this and added that this long haul freight did not go through the city. The company was equipped to take it around the city and make connections with the steam roads.

Mr. Spring hoped there would not be any misunderstanding of his paper. He said he had handled the subject in its broad sense taking the roads as a whole. He could pick out a road here or a road there, the same as the gentleman who had just spoken and no doubt the result which he referred to could be obtained. There were roads where this same result could be obtained, for instance, roads in the northwest where they had heavy steam road construction and where the roads were connected with the steam roads. Those roads had been built with a view to handling that character of traffic and the equipment and the power stations and everything had been constructed with that in view. He was speaking of the ordinary interurban road. No one would claim that a train of fourteen cars could be taken from Cincinnati to Detorit. It would be possible but not feasible.

Mr. Hippe realized that it could not be done on the ordinary interurban road. There would be difficulty in getting through the various towns. That was the biggest objection that he could see to it.

Mr. Spring said he knew of only one power station along the line that could handle that train.

H. M. Brinckerhoff asked if it were not true in regard to the interurban cars hauling freight, that they were geared up to such high speeds that they were not suitable for hauling heavy loads?

Mr. Springer assented.

Mr. Brinckerhoff had met a peculiarity of that sort in using the elevated cars which were operated on the Metropolitan Elevated, on the Aurora Elgin & Chicago. These cars were run to haul coal, and it was discovered that some of the old motor cars, with very low gearing, very low speed cars, would haul five and six, and if he was not mistaken, seven fully loaded coal cars. They went at a slow rate, but they would go up the heavy grades on that line successfully and very economically, so that they handled a great deal of their coal in that way and it was made profitable. He thought that was the secret of the defect in the interurban cars. If a few cars could be fitted with a different gear ratio it would be found that the current consumption, that is the maximum current required in starting would not be so large, and consequently there would not be tremendous jerks on the power stations. On some of the roads he had been over he said he had noticed a very successful development of hauling stock from crossroads, where the farmers brought it, and the electric roads took the stock to the steam roads instead of the cattle being driven for considerable distances. For a small amount of money a stock loading platform could be erected and the farmer accommodated at his barn yard, and the electric railroad would get the haulage of the cattle to the connecting steam railroad. He would like to know whether the steam railroads objected to that, whether it was not possible to work in harmony with them, so as to develop a business along that line; not to compete with them, but to feed the business to them which the electric roads gather at the cross-ways.

Mr. Spring answered that that is a matter which the roads of Ohio and Indiana had been trying to arrange; to come to some amicable arrangement with the steam roads. At the present time the steam roads did not recognize any comity at all with the electric railroads. An arrangement could be made with the steam roads to interchange car-load lots. The electric roads could work up a certain amount of business, which could be turned over to the steam roads, which would be profitable to both, but he thought it almost impossible up to the present time to get them to recognize or work together in any way or manner.

Mr. Gonzenbach said he was reminded of the remarks of President Ely at the Saratoga convention. He had spoken of having tried to obtain traffic arrangements with the steam roads and the most he got was the glad hand and some cigars. There seemed to be an effective gentleman's arrangement among them not to recognize electric railroads, and he thought the same conditions were in effect today. The agreement held and they still got the glad hand, minus the cigars.

Mr. P. P. Crafts, of Clinton, Iowa, said that he operated an interurban railroad between Clinton and Davenport. The line was built for heavy passenger service, or any freight service it could haul, but there were restrictions in the terminal sites by an ordinance which prohibits us from hauling anything through the streets that was not akin to a standard passenger coach, but they could haul a so-called baggage car. They went into the business of hauling freight and express about a year ago in rather a tentative manner. They started in to call it "express"; but eventually let go of that bluff and called it "freight." They haul anything which they could get into the cars, from a one pound package to a nineteen hundred pound reaper which would go into the door of the car. Rates were based entirely on the distance carried, and claims for business were based wholly on the service they were able to give. He said they were in strict competition with the Burlington, the Rock Island and the Milwaukee, all of which run through Davenport, but they worked in connection with the Chicago & Northwestern. There was no recognition, no tariff agreement with them, but on account of the service, although two local charges were made, they had nearly trebled the less than car load business for goods out of Davenport. They had succeeded in running up freight car earnings to nearly 45 cents per car mile. To exceed that point, it would be necessary to add to the equipment. There was a contract with the American Express Company, but that company was not allowed to haul any local goods on the cars. The reason was that their business was on a tonnage basis and if local stuff was hauled for them on a tonnage basis the railway would get practically nothing for it.

President Ely then called for the paper on "Tickets and Rates," by F. W. Coen, secretary and treasurer, Lake Shore Electric Railway Company, Cleveland.

Mr. Coen presented the paper as it is given elsewhere. It was not discussed.

The next paper, entitled "Some Notes on the Evolution of Electric Transportation," was by Theodore Stebbins, expert National Civic Federation, Cohasset, Mass. Mr. Stebbins was not present, and in his absence the paper was read by title and ordered embodied in the proceedings.

The chair appointed the following committees:

On nominations: C. D. Wyman, chairman, Mass.; G. Tracy Rogers, New York; A. H. Nicholl, Indiana; John A. Beeler, Colorado; E. K. Stewart, Ohio.

On resolutions: R. E. Danforth, New York; L. D. Mathes, Iowa; D. A. Hegarty, Arkansas.

The meeting then adjourned until 2 o'clock.

Afternoon Session.

The convention assembled after recess at 2:30 p. m. with viceVice-President James F. Shaw, of Boston, Mass., in the chair.

Vice-President Shaw suggested that on account of the limited attendance the report of the committee on rules be postponed until later in the afternoon.

As the first order of business was taken up the paper, "Electric Railway Employes and the Young Mens Christian Association," by E. M. Willis, railroad secretary, International Committee of Y. M. C. A., New York City.

Mr. E. M. Willis then read the paper which appears elsewhere.

At the conclusion of the reading of the above paper, Mr. Willis said that as his time was not up by a minute and a half he would conclude by saying that he would refer to any of the gentlemen who are connected with the properties where there ar now street railroad associations to verify what he had said. Mr. Ford, of Ford, Bacon & Davis, Mr. Brockway, Mr. Danford, Mr. Wilcox and Mr. Hicks, all of whom were here at this convention, and Mr. Huff, of Richmond, and the managers of the Memphis and Birmingham Street Railway Associations were among those to whom he could refer.

He expressed a desire for co-operation in every possible way with all street railway companies, believed that the officers who were here and who had the interests of the men at heart, were in sympathy with this work.

Mr. E. G. Connette, Worcester, Mass., moved that a vote of thanks be tendered to Mr. Willis, and the motion was unanimously adopted. There was no discussion.

The next order of business was a paper on the subject of "Selection of Trainmen," by C. E. Learned, superintendent of inspection, Boston Elevated Railway Company, Boston, Mass., Mr. Learned read the paper. It appears elsewhere.

Vice-President Shaw then called for the next order of business which was a paper on the subject "Discipline of Trainmen," by F. W. Brooks, assistant general manager Detroit United Railway, Detroit, Mich. On account of the absence of Mr. Brooks, the secretary read the paper. It is published elsewhere. There was no discussion.

The next order of business was a paper on the subject, "Uniforms and Badges," by John R. McGivney, purchasing agent New Orleans Railway & Light Company, New Orleans, La.

Mr. McGivney then read the paper which appears elsewhere. There was no discussion.

Vice-President Shaw then called for the report of the committee on rules of which Mr. E. G. Connette was chairman.

Mr. Connette presented the following report:

The committee are pleased to report that the replies received from data sheet No. 11, which was sent to the members of the association, show that a large number of street railway companies have adopted the Standard Code of Rules as approved by the association at its annual convention in St. Lous, in 1904.

Owing to local conditions some of the companies have added new paragraphs to some of the rules. Such additions were designated by using the same rule number to which the addition was made, together with an affixed letter, as for example: 17A-17B, etc. In some cases where the local conditions would not permit of the use of certain rules, they have been omitted; the number left vacant, thus preserving the integrity of each standard rule under its own number.

The general rules are numbered from 1 to 100, inclusive; rules for conductors from 101 to 200, inclusive, and rules for motormen from 201 to 300, inclusive; interurban rules commencing with No. 1 and using the prefix letter "I."

From the replies received, the committee have deemed it advisable to revise the interurban rules, which were submitted to the St. Louis convention, so as to conform to the practice of moderate-speed interurban service. All companies operating high-speed electric railroads expressed a desire that the committee formulate a code of rules for high-speed interurban service, and we beg to sumbit, therefore, for the consideration of the convention, a set of rules in pamphlet form for the operation of trains on high-speed electric railroads. These rules conform, as far as practical, to the rules of the American Railway Association for the operation of steam trains, as the operating conditions of high-speed electric railroads is so nearly identical with the operation of steam railroads that the committee do not believe it is wise to depart from the steam railroad practice any further than changed conditions necessary for the operation of electric railroad may require. E. G. Connette, E. C. Faber, E. J. Ron, committee.

After reading the above report Mr. Connette said that the committee had not made any alterations in the standard code of rules as adopted by the association at its meeting in St. Louis in 1904, except in the case of the interurban rules. The interurban rules for moderate speed lines have been changed so as to, as far as possible, conform to the rules of high speed electric railroads, especially so far as signals were concerned. It would be found that the signals for moderate speed roads conformed almost identically with the signals provided in the rules for high-speed electric railroads. Owing to the requests of all of the high-speed electric railroads, meaning thereby roads that are operated on private rights of way and trains running at high rate of speed, and on which the service was almost identical with the service rendered by steam railroads, in making the code of rules to conform to those conditions the committee believed that it should follow as far as the conditions would permit, the rules as compiled by the American Railway Association. That association, composed of steam railroad men, formulated these rules for the government of trains on steam railroads, and this code of rules as compiled by the American Railroad Association combines the wisdom and experience of years. The committee did not believe that any committee appointed by this association could to any great extent improve upon the rules which had been adopted by that association, and it had therefore, in compiling this code of rules for high speed roads, conformed as far as practicable, as far as the conditions would permit, to the rules as contained in the code of the American Railway Association.

Some years ago, perhaps five years ago, the Street Railway Association of the state of New York appointed a committee to arrange a standard code of rules for the government of street car lines. The present chairman was the chairman of that committee. The committee was confronted with the conditions which existed in New York state; for instance, by the conditions in local circumstances, New York City as compared with some little hamlet where there was a road running two or three cars, and it seemed at first as if it were almost an impossible task to arrange a joint set of rules which would be applicable to all the lines alike; but after working on the matter for three years the committee finally arranged a code which was submitted to the association and approved. The State Board of Railroad Commissioners, of the state of New York, after carefully examining the rules, approved them. That, said Mr. Connette, was the code that the committee submitted to the St. Louis convention in 1904 and which was adopted by the convention. Those rules are simple, they have no superfluous words or sentences and are compiled with a view to covering the general conditions. Of course, it was realized that local conditions might require some additions to the rules, but whatever those additions had been made, where roads had adopted those rules, the additions had been made without changing any of the rule numbers, simply by adding an affix letter to the number and maintaining the integrity of the numbering of the rules as contained in the standard code. Some roads found that some of the rules contained in the book were not applicable to their lines, in which case the rule was simply omitted. The number was placed in the book, with a line of stars opposite the number, but the rule left out, so that the integrity of the numbering of the rules was maintained. The object of that was this—that in the course of time the rules governing street railroads should be absolutely uniform, the same as they are on steam roads, so that a motorman who is operating a car in the city of Columbus and goes to the city of San Francisco will know when he is employed there what rule No. 17 is. He would be thoroughly familiar with it and there would be no chance for confusion.

The chairman suggested that any alterations or additions to the rules that might occur to any of the members of this association should be submitted to the Standard Rules committee for its consideration.

He believed that the association had appointed this committee as a standing committee that would be continued from year to year until a standard code of rules which would be entirely satisfactory should be reached.

Mr. H. C. Page, of Springfield, Mass., moved the report of the committee on rules be accepted and the suggestions of Mr. Connette approved. (Motion carried.)

The meeting then adjourned until 10 o'clock on Friday morning.

ACCOUNTANTS' ASSOCIATION.

The closing session of the Accountants' Association was called to order by President Brockway at 10:40 a. m. Thursday, October 18, 1906. Robert N. Wallis, treasurer of the Fitchburg & Leominster Street Railway, Fitchburg, Mass., presented a paper, entitled "Depreciation as Applicable to Electric Railways," which was followed by a discussion. The meeting concluded with the installation of the president-elect, Mr. C. S. L. Tingley, second vice-president of the American Railways Company.

Mr. B. A. Hegeman, Jr., president of the U. S. Metal and Manufacturing Company, arrived from New York Thursday and remained during the day looking after his exhibit located in Building 1, Section 6, space 9.

The temporary button-badges of the several associations were exchanged yesterday for permanent badges which were reserved for distribution Wednesday afternoon. Those who have not yet turned in the badges first assigned them can now do so at the booth of their respective associations.

ELEVATED RAILWAYS AND THEIR BEARING ON HEAVY ELECTRIC TRACTION.*

BY H. M. BRINCKERHOFF, ELECTRICAL ASSOCIATE OF WILLIAM BARCLAY PARSONS, CONSULTING ENGINEER, NEW YORK CITY.

When entering upon a new field of activity, or upon a line of work exceeding in magnitude anything heretofore attempted, one naturally looks about in an effort to ascertain what has been done in similar undertakings that may in one way or another supply some useful lesson or be a guide in shaping the new development. The demand for greater terminal facilities for the steam railroads in our great cities and the necessity for doing away with the smoke incident to steam locomotive operation in the tunnel approaches to such termini has practically forced a peculiar limited application of "heavy electric traction" in the steam railway field. The new and varied problems that have arisen have engaged the attention and received the most careful study from the foremost electric engineers in the country, together with the steam railway officials whose systems are involved. In the course of this work much has been said and written upon this and related subjects, so that the questions involved have become more or less familiar to the reading railway men, whether steam or electric. In an effort to present to you something that possibly may have been overlooked and yet be of some present interest in connection with the "heavy traction problem," I will point out some features that have been impressed upon me in elevated electric railway operation which may have a bearing on the subject under discussion.

I think it is a safe statement to make that the elevated railways present the best example of systems, approaching heavy electric traction conditions, that have been operated for a sufficient period and on a large enough scale to give us good operating data, and show the results of standardization and thoroughly systematized management.

The interurban railways have made wonderful strides in the past few years, but the number of car equipments employed and the periods they have been in service have not given them the severe trying-out process of continued heavy use such as has been the case with the elevated railways.

Commencing with the Intramural Railway at the Columbian Exposition at Chicago in 1893, the Metropolitan West Side Elevated in 1895, followed by the Lake Street (now Oak Park), the South Side Elevated, and the Northwestern Elevated, all in Chicago, and the Manhattan and Brooklyn Elevated in New York City, and the Boston Elevated in Boston, we follow through a period of thirteen years of successful practical daily performance of very severe service.

These elevated railway systems of Chicago, New York, Brooklyn, and Boston, including the Interborough subway service, operated in round figures 170,000,000 car-miles, carried 685,000,000 passengers, and made gross earnings of about $34,300,000 during the year 1905.

This was accomplished with electrical equipments. The South Side and Oak Park lines in Chicago, and the Manhattan and Brooklyn lines in New York and Brooklyn, originally were run with steam engines, which, therefore, gives us a basis upon which to draw some interesting comparisons. Through the courtesy of the managers of these properties I am able to give you the following data, placing the roads in the order in which they were converted from steam to electric operation.

Chicago & Oak Park Elevated Railroad.

Steam year of 1905	Electric year of 1904	Increase per cent
Passenger cars, 100.	123 (includes motors).	
Locomotives, 35.	42 (motor cars).	
Total car miles, 2,721,965.	4,550,799.	
Total passengers hauled, 9,936,450.	16,005,328.	
Passengers per car-mile, 3.65.	3.52	3.6
Passengers per car per annum, 99,364.	130,124	23
Cost per car-mile, $0.1174.	$0.1078	8.2
Schedule speed, 12.5 m. p. h.	15 m. p. h.	22

Period of electric operation, eight years.

South Side Elevated Railroad (Chicago).

Steam year of 1904	Electric year of 1905	Increase per cent
Passenger cars, 110.	254.	
Locomotives, 31.	196 (all motors).	
Total car miles, 5,182,598.	8,230,415.	
Total passengers hauled, 13,587,791.	32,959,752.	
Passengers per car-mile, 2.62.	4.00	52.6
Passengers per car-mile per annum, 123,525.	129,762.	5
Cost per car mile, $0.106.	$0.089	16
Schedule speed, 13.08 m. p. h.	14 95 m. p. h.	14.3

Period of electric operation, seven years.

Brooklyn Rapid Transit (Elevated Division, Brooklyn.)

Steam year of 1898	Electric year of 1905	Increase per cent
Passenger cars, 430.	1,002 (includes motors)	
Locomotives, 139.	558 (motor cars).	
Total train miles, 5,158,365.	Car-miles, 22,407,331.	
Total passengers hauled, 44,170,810.	122,166,540.	
Passengers per car-mile, ——.	5.2.	
Passengers per car per annum, 102,823.	121,922.	18.7
Schedule speeds, 11.5 m. p. h.	15.8 m. p. h.	37
Cost per train-mile, $0.384.	Cost per car-mile.	

Period of operating, six years.

Under steam operation this company's records were kept in train-miles, and no estimate of cars per train at this date is reliable. Electric operation data is kept per car-mile but the costs are so involved between the street car and elevated systems as to make an exact figure impossible to reach, the power for both systems being generated and distributed without means of separate measurement. Both kinds of equipments being operated on surface and elevated tracks, also makes the division of costs purely arbitrary. The general indications are, however, that the cost per car-mile is slightly less with electric than with steam, at the same time giving an increased schedule speed.

Manhattan Elevated Railroad (New York).

Steam Year of 1901.	Electric Year of 1904.	Increase per cent.
Passenger cars, 1,122.	1,356 (includes motors)	
Locomotives, 334.	833 (motors).	
Total car miles, 43,860,158.	61,743,00.	40
Passengers hauled, 190,045,741.	286,634,000	50
Passengers per car-mile, 4.34.	4.65.	7.15
Passengers per car per annum, 169,381.	211,382.	24.8
Cost per car-mile, $0.1198.	$0.095.	20.4
Schedule speed, 10.1 m. p. h.	15 m. p. h.	48.5

Period of electric operation, three years.

Manhattan—Interborough (1905).

Including subway service.

Passenger cars	2,348
Motor cars	1,322
Total car-miles	79,950,791
Passengers hauled	339,104,820

Schedule speeds: Elevated, 15 m. p. h.; subway local, 15 m. p. h.; express, 25 m. p .h.

Period of operation (subway), one year.

For later references and to complete the list the following statistics are added for the roads originally equipped electrically.

Metropolitan West Side Elevated Railway (Chicago, Year of 1895).

Passenger cars	420
Motor cars	158
Total car miles	11,352,358
Passengers hauled	46,186,753
Schedule speed, m. p. h	15.4
Cost per car-mile	$0.0931

Period of operations, ten years.

In all the cases "cost per car-mile" given is the total operating expenses for the road, not including taxes, divided by the total car miles.

An examination of these figures for steam and electric service shows in every case a decreased cost per mile, an increase in schedule speeds, and a very large increase in traffic.

In considering the decrease in cost per mile with electric over steam operation in the above comparison, the fact of the increased speed must be especially noted as the higher rate of acceleration necessary to give the higher schedule speeds means a great increase in power consumption, so that the decreased cost shown on the face of the figures does not at all represent the true relative economy.

As an example, the South Side Elevated Railroad of Chicago increased its schedule speed from 13.08 to 14.95 miles per hour. This represents an increase in power required per car-mile of fully 30 per cent.

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* Read before the American Street and Interurban Railway Association, Columbus, O., October 18, 1906.

Even more marked is the increase on the Manhattan Elevated, where the actual running time was 10.1 miles per hour, under steam, and which has been raised to 15 miles per hour with electric operation. An increase in speed of 48.5 per cent. With a cost per car-mile of $095, the proportion chargeable to power will range in this class of service from $.019 to $.042, a little less than 25 per cent of the total. By "cost of power" is meant the total operating expenses incurred in producing and delivering current to the car. The maintenance of the motor equipment and kindred items will also quickly show the effects of changes in schedule speed and must be considered in these comparisons.

For these reasons had the speed not been increased above the steam schedules when the change in motive power was made, the electrical equipment would have shown, in some cases, from 25 to 30 per cent decrease, other conditions remaining stationary.

As the objection is sometimes made that the figures we are considering are derived from electric apparatus in use but a few years and are being compared with old steam apparatus figures, let us examine the record of the Metropolitan West Side Elevated Railway of Chicago, in operation electrically now for eleven and one-half years, which stands, therefore ,on a fairly equal footing with the other steam elevated equipments.

On the data sheet herewith are shown:

First. The curve giving the average passengers per day, plotted by months, except for the year 1905, which is shown for brevity, by the daily average for the year.

Second. The average car-miles per day similarly plotted.

Third. The schedule speed in miles per hour. This is represented by a sloping line from 13.9 miles per hour in 1898 to 14.4 miles per hour in 1905. This method of representation was resorted to for simplicity, as the road having four branches, which, fro mtime to time, were extended, the schedules were changed so frequently that the facts could not be intelligibly shown in a single curve. The main fact, however, that the schedule speed of 13.9 miles per hour, early in the operation of the road has been raised by various intermediate steps to 15.4 is indicated. This does not include the speed on the Union loop, which is 10 miles per hour and is considered as a downtown terminal for the elevated roads.

Fourth. The average cost per car-mile given by years.

It will be seen that this, commencing in 1900 at .0751, increases gradually to .0971 in 1904 and decreases to .0931 in 1905, with the introduction of the multiple unit system. This change to multiple control involved the purchase of only 55 new motor equipments, raising the number of motor cars to 158. The service is still locomotive in type during 16 of the 24 hours, two motor cars per train only being in use during the heavier periods of travel, the average cars per train throughout the year being less than three. It will be noticed that the rates per hour or per day paid to employes increased about 14 per cent and the price of coal about 20 per cent in the same period.

Here, then, is an electric system that has been in operation ten years ,upon which the motors, rolling stock, track system, etc., have developed a practically constant maintenance charge. That this road, making a schedule speed of over 15 miles per hour, should now be showing, in its tenth year of operation, $0.0931 per car-mile is a very reasonable argument for the economy and durability of an electrically equipped system. Referring again to the comparative figures on the electric railroads that have changed their form of motive power, we find increases in earnings per mile, per car per annum, etc., all of which simply point to the greater earning capacity of the electric car unit.

This greater earning capacity is shown to be due, in the systems we are considering, to higher schedule speed along the line and the shorter intervals between train units, made possible at junctions and terminals. As examples of these features take the following:

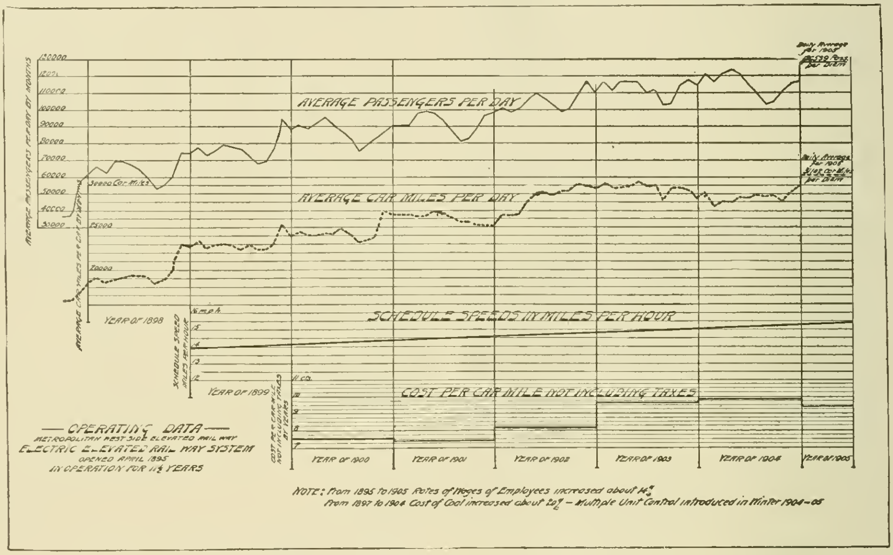

Figure 1—Data Sheet Showing Passengers, Car Miles, Schedule Speed and Costs.

The New York terminal of the Brooklyn Bridge depended originally upon steam locomotives for its operation. Cars were hauled by cable across the bridge and then switched at each end by steam locomotives. The service proved inadequate and upon electric motors being installed under the bridge cars the locomotive system was done away with and a remodeling of the track system was made possible, which resulted in doubling the capacity in cars per hour.

On the Manhattan elevated system all of the Ninth avenue trains and the Sixth avenue trains, which run north of Fifty-ninth street, pass through the junction at Ninth avenue and Fifty-third street. These tracks, two local and one express, lie north and south on Ninth avenue and two turn east in Fifty-third street to join the Sixth avenue line. The capacity of this crossing, therefore, controlled the amount of service it was possible to give on the west half of the Manhattan system.

The north-bound tracks on Ninth avenue, approaching from the south, have an ascending grade of 107 feet to the mile. Through this junction steam trains of five cars were scheduled to operate at an interval of from 55 to 70 seconds during the rush hours ,but blocks were so frequent on account of the locomotives stalling on the up-grade in the evening rush as to make the service very unreliable. The length of interval was largely controlled by the necessity of holding the train back almost at Fifty-first street until the route was clear in order that the steam engine might be sure of getting up the grade. With electric equipment trains of seven cars run right up to the target at the crossing and stop with impunity on the grade, the regular rush hour operation now requiring a train movement every 33 seconds as a minimum, which is accomplished with regularity and precision and blockades are things of the past.

On the two-track stub terminal at the City Hall station, Manhattan elevated trains now operate on a 100-second interval.

In general terms the irregularity at junction points, congestion at terminals and the limitations in speed of the locomotives on the Manhattan elevated had caused the system to reach its maximum usefulness, the largest regular business day's traffic being 852,000 passengers and the total traffic for the last years of steam operation actually showing a continual decrease. With the introduction of electric service, the maximum traffic, without adding a foot of track, jumped to 1,076,000 passengers as the largest regular day's business, an increase upon the best showing of steam of over 26 per cent.

You will readily note the large increase on the other systems, which results, however, are complicated in some cases by reason of increased trackage having been put in operation, and, therefore, not making so striking a comparison as the Manhattan elevated in New York. Enough has been shown, however, to warrant the claim for a greatly increased capacity by electrically equipping these systems.

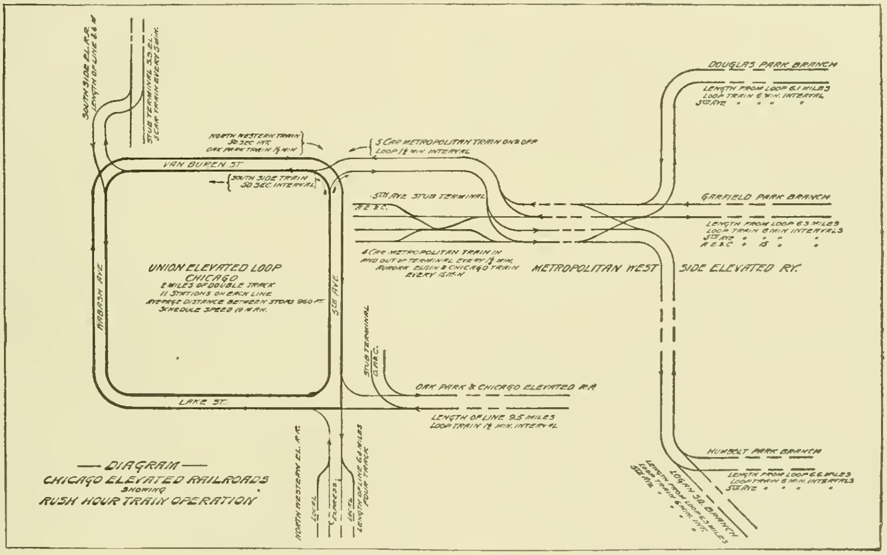
SOUTH SIDE EL. R.R.
LENGTH OF LINE 8.6 M
STUB TERMINAL 33 ST. EL.
5 CAR TRAIN EVERY 5 MIN.
NORTH WESTERN TRAIN 30 SEC. INT.
OAK PARK TRAIN 1½ MIN
5 CAR METROPOLITAN TRAIN ON & OFF LOOP 1½ MIN INTERVAL
VAN BUREN ST
SOUTH SIDE TRAIN 30 SEC. INTERVAL
DOUGLAS PARK BRANCH
LENGTH FROM LOOP 6.1 MILES
LOOP TRAIN 6 MIN. INTERVAL
5TH AVE
5TH AVE. STUB TERMINAL
A.E. & C.
GARFIELD PARK BRANCH
LENGTH FROM LOOP 6.3 MILES
LOOP TRAIN 6 MIN INTERVALS
5TH AVE
A.E. & C. 15
4 CAR METROPOLITAN TRAIN IN AND OUT OF TERMINAL EVERY 1½ MIN.
AURORA ELGIN & CHICAGO TRAIN EVERY 15 MIN
METROPOLITAN WEST SIDE ELEVATED RY.
UNION ELEVATED LOOP
CHICAGO
2 MILES OF DOUBLE TRACK
11 STATIONS ON EACH LINE
AVERAGE DISTANCE BETWEEN STOPS 960 FT.
SCHEDULE SPEED 10 M.P.H.
WABASH AVE
5TH AVE
STUB TERMINAL O.P.&C.
OAK PARK & CHICAGO ELEVATED R.R.
LAKE ST.
LENGTH OF LINE 9.5 MILES
LOOP TRAIN 1½ MIN. INTERVAL
HUMBOLT PARK BRANCH
LENGTH FROM LOOP 6.6 MILES
LOOP TRAIN 6 MIN. INTERVALS
5TH AVE
LOGAN SQ. BRANCH
LENGTH FROM LOOP 6.3 MILES
LOOP TRAIN 6 MIN. INT.
5TH AVE
— DIAGRAM —
CHICAGO ELEVATED RAILROADS
SHOWING
RUSH HOUR TRAIN OPERATION
NORTH WESTERN EL. R.R.
LOCAL
EXPRESS
LOCAL
LENGTH OF LINE 6.4 MILES
FOUR TRACK

Figure 2—Diagram Showing Union Elevated Loop in Chicago.

Let me dwell a moment longer on the frequency of service by showing what is the daily routine on the Union Elevated loop in Chicago.

Referring to the diagram, you will see that the "Loop" is a double-track line two miles in length, located on Van Buren street, Wabash avenue, Lake street and Fifth avenue, a rectangle surrounding the business and shopping section of Chicago. On the inner track run the trains of the Metropolitan and South Side Elevated roads and on the outer track, in the reverse direction, run those of the Northwestern and the Chicago & Oak Park elevateds. This requires a crossing at grade on the traffic of the various roads. At the southwest corner of the loop (Fifth avenue and Van Buren street) the Metropolitan trains enter and leave, passing to and from their own tracks to the inner track of the Union loop. The Northwestern and Oak Park trains cross the outgoing and incoming tracks of the Metropolitan, and South Side trains occupy the inner curve when passing from Fifth avenue to Van Buren street.

To obtain the greatest capacity, incoming and outgoing Metropolitan trains move simultaneously through this junction and similarly South Side and Northwestern & Oak Park trains are handled by one movement.

This results in the following train movements on every week day, Sunday being somewhat lighter.

Train Movements—Metropolitan Junction, Union Loop, Chicago.

During 24 hours 1,776 trains are handled, averaging one every 49 seconds.

During two hours, 4:30 to 6:30 p. m., 263 trains are handled, averaging one every 27½ seconds.

During one hour, 5 to 6 p. m., 163 trains, averaging one every 22 seconds.

During 15 minutes, morning, rush, 75 trains, averaging one every 12 seconds.

The South Side Junction at VanBuren and Wabash avenues, is simultaneously handling substantially the same train movements.

During rush hours practically all of the trains consist of five cars, there being only a few of four cars.

When you stop to consider that this is not a single isolated performance, but the daily week-day routine and that these rush hours from which the congested periods cited are taken occur twice each day, it gives a good idea of the precision and regularity with which electrically equipped trains can be handled.

Follow this matter a little further in detail and note what is exacted from this set of train units above the mere promptness with which they pass this point in the system.

Referring to our map, we will note that the Union loop receives the trains of four distinct elevated railway lines.

Now, in order that this junction shall operate smoothly, the trains must be at their targets ready to move instantly when given the signal. They cannot be lined up in a row to insure this condition, otherwise the passengers will be delayed and dissatisfaction ensue. The running time cannot be lengthened out so that the motorman can loaf along and bring his train to this point with ease, for the street car competition is severe and the time must be cut to a minimum. The various roads maintain on their own lines during the rush hours schedules of from 14½ to 15½ miles per hour, including stops. It takes practically the entire equipment of the road to fill the rush hour schedules, so that running out gap-trains is not generally possible. Here, then, we find trains of five cars passing through this junction "on time," delivering or receiving their heavy load, returning to their outer terminals and again returning a second time in the same rush hour period and "on time." Add to this that the Northwestern runs express and local trains, making entirely different runs on separate tracks after leaving the loop. The South Side runs trains into its Congress street stub terminal.

The Lake street runs also into its Market street stub, and further, the Metropolitan has four distinct branches, from each of which is run not only the loop trains, but an equal number of Fifth avenue trains, leaving the outer terminals alternately with loop trains and running into the Fifth avenue terminal. The Metropolitan loop and Fifth avenue sets of trains each run on a 1½-minute interval, the Fifth avenue terminal also accommodating the interurban trains of the Aurora, Elgin & Chicago road on a 15-minute interval during the rush, those passing over the Garfield Park line to the city limits.

That such a complication and frequency is in itself desirable I do not pretend to claim, but that it is a demonstrated operative fact, is undeniable.

The amount of service exacted of the equipments of these roads is also interesting, it being a fact that practically all of the motor cars on the Metropolitan Elevated, for example, except those in the paint shop or in the general repair shop for general overhauling, are in service every rush hour. This is accomplished by arranging for the inspection at other than rush hours and by the use of extra motor trucks, which are interchangeable.

Some of these cars, of course, make only two trips each rush hour, but they were ready for further use if required. The total mileage on the Metropolitan Elevated for 1905 shows an average of 24,740 car-miles run per car (motor and coach) per annum, which, considering that 50 per cent of the passengers are handled in four hours of the day, shows a high degree of "availability for service."

A detailed record of 105 Metropolitan Elevated motor cars, which made over 3,500 miles per month each during the twelve months from May 31, 1905, to June 1, 1906, shows that the general periodic overhauling, the regular inspection at terminals and time in shop for repairs to the electrical apparatus, running gear, air brakes and all parts of the equipment, calculated in hours, amounted to less than 3 per cent of the time. In other words, these cars which did the heavy work during the year 1905-1906 were available for service 97 per cent of the time.

To accomplish this service the following method of inspection is used:

Motor cars are inspected at terminal shops every 600 miles; this takes one hour per car.

Cars are given general overhauling of motors and control every 13 months; this takes generally two days.

Motor cars average generally on this road 4,500 miles per month.

Generally speaking, the statistics for steam locomotive service indicate that from 8 to 12 per cent of the time out of service represents a high state of efficiency, while on some roads 25 per cent of the time "in shop" or an "availability for service" of 75 per cent is nearer the figure for locomotives, making a mileage comparable with electric motor mileage of 4,500 miles per month, which we have been considering.

It is true that the elevated service, on account of its short intervals between trains, its frequent stops and comparatively light train units, presents an ideal field for electric operations, nevertheless, the extent and period of constant service these systems have gone through brings out some advantages which are interesting in connection with recent and proposed heavy electric traction developments. I think we may say that consideration of the records and results of elevated electric operation, aside from the much-argued question of economy, shows the three following advantages over steam operation:

1. An increased capacity per car unit due to greater "availibility for service" and higher schedule speed.

2. An increased capacity for the system in general, due to shorter intervals possible at terminals and junction points, abolishing relays and general facility for handling at stops and in yards.

3. An increased earning capacity due to 1 and 2 and to more attractive service by reason of greater frequency of trains possible, with economy, a cleaner and quieter service, etc., giving returns in larger proportion than the direct ratio of apparent increased facilities.

In regard to the results to be obtained by substitution of electric for steam apparatus under somewhat similar conditions on the larger steam railway systems, we might reasonably expect to realize the first item, as it is inherent in the nature of the apparatus when its use has been developed to meet the local conditions. This is amply demonstrated, not only by example here given, but by the performance of electric railway equipments generally.

The second item is illustrated by what we have seen is being done daily on the greatly congested elevated systems, where such service would be impossible with locomotives. This forms, I believe, one of the strongest arguments for the new power, that is, the possibility of increasing the capacity of large city termini with electric service. Where real estate values are so enormous and the physical difficulties for enlargement of the terminals so great, the increased capacity of the existing site that it is possible to obtain with electricity is worthy of serious consideration.

Given a large city terminal, surrounded with expensive buildings or possibly bounded by important city streets and which has reached its maximum train capacity with steam operation and we are confronted with enormous expenditures to materially increase the capacity with the old motive power.

With the electric equipment the absence of smoke allows of double-decking, as is being done in the New York Central station in New York. The necessity for a local coal and water supply, round-house, etc., is done away with. The hauling of passenger trains with multiple unit control, which eliminates relay switching engines and adds to the flexibility and ease of handling the units generally; effects an increase in the passenger capacity that could not be obtained with steam without abandoning the existing location or entering into purchases and street-closing proceedings that would be prohibitive in every way.

The third item is one only just being realized in its true extent by railway men. It is a curious fact that electric service actually seems to create business; not only do we see this illustrated in the elevated systems we have been considering, but in interurban work as well. An electric line has often been known to run through a series of towns paralleling a steam railroad and develop a traffic largely exceeding that lost by the local steam line. This additional business being apparently created without increase of population and due to the more frequent and convenient service. It is a peculiar fact that the American citizen is essentially restless and impatient, and, given two competitive systems, he will take that offering the most frequent service, even at a little expenditure of time. He does not want to wait. He prefers to keep moving. Again, trains run on even fractions of an hour are more attractive to him that those run irregularly; he is impatient of time tables; he will not hunt through the a. m.'s and p. m.'s of a steam railroad time table when he knows that every hour, half or quarter hour there is an electric car.

All of these items are at the basis of the successful inroads made upon steam railroad passenger traffic by the electric lines, and I present for your consideration the suggestion that what has been found true of passengers may, in a degree, be found true of local freight business as well. It is not possible that a modification of present steam railway methods may be found profitable in the handling of freight where it has to be hauled with electric traction?

Economy and efficiency in steam railway practice point to constantly increasing size of train units. The lessons of electric operation are just the reverse.

The physical drawbacks involved in steam operation of the large railroad terminals were primarily instrumental in clinching the arguments for "heavy electric traction" for terminal operation. That this system, when once introduced in even this limited form, will extend to main line work seems certain. That we shall see radical changes in steam railway methods in yarding and despatching trains, in reduction in size and increase in number of train units, will, I believe, follow as an inevitable result of the application of electricity to steam railway operation.

REPORT OF THE COMMITTEE ON HEAVY ELECTRIC TRACTION.*

CALVERT TOWNLEY, CHAIRMAN; LEWIS B. STILLWELL,
EDWIN B. KATTE.

As a starting point it seems necessary that the term "heavy electric traction" should be given a specific definition. It is presumed that the definition will include steam railroads or branches thereof which have been electrified. There are, however, many roads which have adopted electric traction from the start, the weight of the rolling stock of which, the capacity of the electric equipment adopted and the operating speeds established are as great as or greater than those obtaining on many ex-steam lines. These electric lines include both the elevated and subway roads in our large cities and many interurban roads as well. Your committee is of the opinion, therefore, in the absence of any other definition, that all such roads would come within the scope of the term "heavy electric traction."

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* Presented before the American Street & Interurban Railway Association, Columbus, O., October 18, 1906.

The committee would be glad to have from the association a clear definition of what is intended to be included by the term "heavy electric traction."

In the absence of any advice as to the scope and duties of this committee we have been reluctant to ourselves to define our scope of duties and to undertake any particular line of work based on such definition. It is the opinion of the committee, which is herewith offered as a suggestion to form a basis of discussion, that we can best serve the interests of the association by investigating and recommending for standardization such matters pertaining to heavy electric railroading as may from time to time be referred to us.

The mileage of the railroads previously operated by steam, and now operated by electricity, is as yet comparatively small, but the electrification of several roads entering New York is well under way, and the projected electrification of other roads there and in other sections of the country gives promise that a very large amount of this kind of work may be expected in the near future. It is naturally desirable that the interchange of traffic between such roads should be facilitated, this being perhaps more essential than is the case with the ordinary trolley roads, whose sphere of operations is naturally more localized. On the other hand, the engineering questions involved in the electrification of steam roads present many new features, about which engineers and operating men are by no means agreed. It would, therefore, be quite as dangerous to at this time undertake too rapid a standardization as it would be to neglect the subject, and your committee, therefore, feels that the questions should be approached with caution, and treated with prudence.

TICKETS AND RATES.*

BY F. W. COEN, SECRETARY AND TREASURER OF THE LAKE SHORE ELECTRIC RAILWAY COMPANY, CLEVELAND, O.

Since the early days of man the matter of transportation, whether covering shipment of merchandise or the handling of passengers, has been a great question, and one which has received much attention from all classes of people. During the past quarter of a century a great deal more attention has been given the subject than in previous years this being especially true in this country. It is not difficult to find why this is the case.

This country during the past 25 years has seen wonderful development, and the transportation companies have been the forerunners of this developmnt. In other words, the Western plains were practically of no use to mankind until the great railroads of the country began to extend their lines into this unimproved and unsettled region. As fast as these extensions were made, the taking up of the land followed, and a period of industrial development resulted, until today the agricultural plains of the West and Northwest are producing their share of the wealth of the land.

The rapid development of any territory depends largely upon its transportation facilities. The Government recognized this fact and to push their lines into and through the undeveloped territories. As soon as these lines were constructed, low passenger rates to prospective settlers were granted by all of the companies in order that the territory might be settled quickly. These same railroads, however, in many cases, did not follow the same course with their freight rates as with passenger rates, and, in consequence, the farmer, in many instances, was unable to market his crops on account of the high transportation charges.

This question is of such interest to all classes of people that during the past few years especially there has been continuous agitation on the matter of rates looking toward readjustment. One can scarcely pick up a daily newspaper or a magazine of the present day without seeing some article in which the transportation companies of the land are attacked vigorously by the writers. The politician, ever quick to grasp some popular subject, has also taken advantage of the agitation by the public, and has endeavored to further his own political ambition thereby.

We have today among some of our most prominent people those who believe, or profess to believe at any rate, that the transportation interests of the country, from the standpoint of the public, are not safe in the hands of the corporations, but should be owned and controlled by the Government.

I verily believe that the transportation companies in general are, to some extent, responsible for this condition. That certain communities have been "held up," as it were, in the matter of both freight and passenger rates, there can be no doubt.

Many of the railroads, either directly or through the individual interest of their officials, have been interested in industrial concerns of one kind or another located along these transportation lines, and these concerns have, in a great many instances, been favored both in rates and in service. Again, there are many cases where the influence of heads of departments, or officials under whose jurisdiction this matter came, has been purchased by the industrial concerns, and in consequence, any concern which did not buy this influence, or, in other words, which did not have the advantage of the favoritism of the transportation companies, could in nowise compete in that field. Glaring examples of such discrimination in favor of certain companies have come to light in the recent investigations made by the Government. It has been shown beyond any question that the Standard Oil Company, the so-called "Beef Trust" of Chicago, the coal companies of the East, and many others have been granted special rates in the form of rebates; extra mileage has been allowed them for use of their equipment, passenger transportation has been furnished their officials in one form or another—all of these tending to reduce their transportation charges. It is not strange, therefore, that the public at large should be so agitated over this matter, that it is a popular outcry throughout the entire country that transportation rates are too high.

Public opinion has been aroused to such an extent that the last congress was compelled to pass new and, in some particulars, stringent laws governing transportation companies in order that all patrons of the railroads should be treated fairly and equitably. The scope and authority of the Interstate Commerce Commission was also greatly enlarged.

We, as representing transportation companies, oftentimes forget to look at this question from all standpoints. We must not blind ourselves to the interests of the people in this great question, nor to their rights, as it is only by the will of the people thaat any of our concerns are allowed to exist.

The sentiment of the people against some transportation companies has made it easy for a competing company to enter the field and secure from authorities, where necessary, rights to build and operate a railroad. This statement is applicable both to the steam road and electric lines. Whether competition is of any direct benefit to the people is a serious question. If the existing company were to gradually reduce the rates whenever it is possible, it would, I believe, result in a better and more satisfactory arrangement for the people and the corporate interests as well.

Interurban roads have, I believe, a better standing today before the public than any other class of transportation companies, and it is our duty in every way possible to preserve and promote this favorable sentiment.

Any transportation company is entitled to a proper return for service performed. Just what that return should be is a very difficult matter to determine. Many things must be considered in arriving at any definite conclusion. The cost of construction, or operation, taxes, depreciation, income on investment, etc., all go to make up this cost. These charges may vary considerably on account of varying conditions. One property may be built on an expensive private right of way, with modern construction, good equipment, etc. In this case it is fair to presume that the fixed charges will be high and operating charges low, comparatively speaking. Another road may be built on highway franchise, cheap construction throughout, and, in consequence, the fixed charges are small, and, more than likely, operating charges are high. The item of depreciation is of considerable importance in arriving at a proper charge. It is not, therefore, altogether fair that any rate should be based on operating cost, unless, perhaps, it be an average cost. That one property can be operated more economically than another goes without saying—conditions differing largely.

However, the passenger is not responsible for the building of a good road nor a poor one; nor is he responsible for the building of a road in a territory which will not support it, when a fair rate is charged. We sometimes try to make ourselves believe that a property should earn a certain amount of money regardless of the fact that the people, our patrons, are not there in sufficient numbers. If such a policy is pursued we make the few carry the burden.

The public at large has become restless and is demanding that rates, both for the transportation of passengers and freight, be readjusted. The steam roads in the central West have harkened unto the cry and are at this time lowering their passenger rates and readjusting them to meet this demand, and to my mind are acting wisely.

In the territory with which I am familiar, few, if any, interurban roads charge more than two cents per mile. Many of these companies are operating under franchise rights granted them years ago, and in most cases are not subject to franchise rate regulations.

I am of the opinion that a road properly constructed in a territory sufficiently populated to warrant the building of a road, can be operated at a reasonable profit on a two-cent mile basis, and at the same time sufficient service for the accommodation of the public be given. In the operation of an interurban road, the matter of rate charged is no more important in the success of the road or of the attitude of the public toward it than the service given by it. As the population increases these rates can and should be lowered accordingly. In other words, a large volume of business can be done proportionately cheaper than a small volume.

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* Presented before the American Street & Interurban Railway Association, Columbus, O., October 18, 1906.

At this time some of us in the state of Ohio are a little disturbed over the establishing by the last legislature of the Ohio Railway Commission, whose authority shall extend over all transportation companies doing business within the state. If the commission established carries out this law broadly and fairly, as no doubt it will, and the railway companies do their part properly and promptly, I believe it will result in much benefit to the general public and to the companies themselves.

A ticket, according to Webster, is a card or a piece of paper which calls for something. Its purpose in the railroad business is to show that the purchaser has paid for transportation from one point to another. Tickets are issued in many forms and may be divided into two general classes, one to be sold by an agent at a ticket office to a passenger and another to be issued by a conductor, being his receipt for a cash fare collected on a train. In one case the passenger gives up the ticket purchased at the office to the conductor in payment of his fare and receives nothing in return. In the other case, he pays his money to the conductor instead of to the agent, and receives a slip or cash fare in return for it.

I am, and always have been, a great believer in the sale of tickets by a ticket agent wherever it is possible. Money received from ticket sales through an agent is sure to reach the treasury of the company.

It is, I believe, the duty of any company to provide a suitable place where passengers may wait for trains, secure information, etc., and any such place requires some one to look after it. An agent representing the company has, or should have, plenty of time to sell these tickets and answer all the questions which a passenger may wish to ask. I also believe that it is advantageous to the company as well as to the passenger to sell a ticket to the passenger's destination, wherever that may be. Many companies sell their tickets at a less rate than is collected on the cars if cash is paid, in order to induce the public to buy tickets at ticket offices.

The conductor of the interurban road today has plenty of work to do in looking after the safety of his train, the embarking and disembarking of passengers, the ventilation of his car, etc. The safety of his train is, and always should be, the first thing to be considered, and it is proper, therefore, that the matter of collection of fares should be made as convenient and with as little work as possible. I do not think any one disputes the fact that tickets can be collected much more conveniently and in much less time than can cash fares.

There are also among our conductors, as well as all classes of people, those who are inclined to be dishonest. In the collection of cash fares there is, I think, more opportunity for dishonesty than in the collection of tickets. Again, many people become dishonest through temptation and if the handling of money can be lessened, the temptation to keep some of it is proportionately lessened. It is true, of course, that tickets can be manipulated by a conductor if he is so disposed, but hardly so easily as cash.

I have always felt that a ticket issued for transportation should be so made that one part would be collected by the conductor and other part retained by the passenger as a sort of identification slip or check. This, however, may not be practical, but, theoretically, to my mind, is correct. By using this form of ticket the passenger has something to show that he has paid his fare in case there should be any dispute about it.

While the business of an interurban road is not quite the same, in a way, as that of the steam roads of the country, yet I believe we made no mistake in following closely in their footsteps, they having had a great many years of experience in such matters.

The Consolidated Car Heating Company's electric heaters are well represented in the cars exhibited by the various car companies here, the all-steel car, made by the Pressed Steel Car Company, for the Boston Elevated Railway, the semi-convertible car for the same company, made by the J. G. Brill Company, the two "pay as you enter" cars, one made by the G. C. Kuhlman Car Company, and the other by the Montreal Street Railway Company, are all equipped with these heaters. On the tracks outside the grounds, the private car of the Detroit United Railways Company is equipped with Consolidated electric heaters, placed in the floor similar to a house register. The heater cases are solid brass and the apparatus is arranged to give four points of heat.

ELECTRIC RAILWAY EMPLOYES AND THE YOUNG MEN'S CHRISTIAN ASSOCIATION.*

BY E. M. WILLIS, RAILROAD SECRETARY INTERNATIONAL COMMITTEE YOUNG MEN'S CHRISTIAN ASSOCIATIONS.

The growth and development of the electric railway lines of the country during the past two or three years have been very rapid, and suburban and interurban trolleys are now reaching villages and hamlets which, heretofore have been practically isolated. Electrical equipment has been greatly improved; larger and more commodious cars have been built. In some places dining and sleeping-cars are now in daily operation. Heavier rails have replaced the old ones; much faster time is being made and runs increased in length considerably.

These new conditions have given occasion for the consideration of the employes in their leisure hours by the officials of the companies. There has been as marked an advance in the standard of the employes as in the matter of equipment, and the men who are now running as motormen or conductors are of a higher type than formerly. An intelligent, practical man in the service can do much toward the saving of time and money when a car gets out of order on the road. Such men are being sought out by the companies.

Many of these young men come from the farm or village, and are generally free from the vices of the young man of the city. In order that they may remain sober and industrious, it is necessary to look after their welfare when off duty. At terminals or junction points these men have time on their hands, and are almost always ready and willing to put it to such use as will enable them to advance in position and salary. Unfortunately at the point of many of these "lay-overs" or 'swings," there are no places where a decent and self-respecting young man cares to spend his leisure hours. The saloon and other places of questionable character are always the first to locate at the terminals, and these conditions make it necessary for some good wholesome agency to counteract their influence.

In the minds of many the Railroad Department of the Young Men's Christian Association is an organization that can do effective work among the men. For thirty years the association has been in operation on the steam railroads of North America. Over 80 per cent of the entire mileage of the country is now co-operating in this movement. There are 221 associations, with a membership of over 82,000 men, and 149 buildings, valued at $2,676,350, are owned or occupied by these railroad associations. The buildings are, in many cases, as well equipped with baths, wash-rooms, alleys, pool and billiards, libraries, reading-rooms, restaurants and dormitories as the average club house. In fact, they take the place of the home for the men who are on the road. Lectures, entertainments, concerts, etc., are given, and religious services held from time to time. It is a common occurrence that when a dispatcher wants a man to go out on the road, he telephones or sends to the railroad buildings. The men are generally to be found in some part of the building, and are ready to report at once in good physical condition for the strenuous work required

The men are charged $5 per year for membership, and a small fee for games and the sleeping privileges. Wherever possible, the undertaking is in charge of a committee of management, consisting of officials and employes, this committee having the direct oversight of the general secretary who is the executive officer. The companies usually contribute $100 per month, heat, light and water. This amount, with the memberships and contributions from interested friends, enables the work to be carried on in a successful way financially.

The general supervision of these 221 associations is, to a considerable degree, under the direction of the railroad committee of the international committee. This committee consists of the following men, all of whom are prominent in railroad or financial circles: John J. McCook, of Alexander & Green, formerly receiver of the Atchison Topeka & Santa Fe, chairman; Charles F. Cox, of the Vanderbilt Lines; Dr. John P. Munn, of the Gould Lines; William A. Patton, of the Pennsylvania; B. D. Caldwell, of the Lackawanna; Abner Kingman, of Canada, with Morris K. Jesup, as chairman of the advisory committee. This committee directs the work of the ten secretaries who are assigned to various railroad systems of the country; two in Chicago, one in St. Louis, one in Richmond, Va., one in Montreal, and the rest with headquarters in New York City. The state and provincial committees of the country are also co-operating in this work ,and in a number of the states one secretary devotes his entire time to the railroad association of that particular state. For several years successful organizations for street railway men have been conducted at Rochester, New York, and Richmond, Va. All of these associations have enlarged their work, the one at Rochester having a downtown branch, and at Richmond, at Petersburg and Manchester branches have been added; all crowded with men day and night. Associations have been opened recently at Memphis, Tenn.; Birmingham, Ala.; Sherman, Cal., and Atlanta, Ga. The following is the list of street railway associations:

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* Presented before the American Street & Interurban Railway Association, Columbus, O., October 18, 1906.

	Members.	Current Expenses.
Birmingham, Ala.	220	$3,000
Sherman, Cal.	150	......
Atlanta, Ga. (just organized)	...	......
Rochester, N. Y. (downtown)	...	6,364
Memphis, Tenn.	400	2,949
Richmond, Va.	684	4,272

Petersburg and Manchester branches included with Richmond.

A number of other cities are contemplating the organization of associations at an early date.

The Railroad Young Men's Christian Associations are organized on christian principles, and this is a great element in their success. Fear has been expressed on occasions that this might hinder their greatest usefulness, but experience has shown that there need be no anxiety in this direction, as every man who is disposed to be decent, whether he be Jew or Gentile, and has a belief in religious things or otherwise, is welcome to membership. The railroad associations have also demonstrated that this plan, endorsed by the company, will bring about the co-operation of both employe and official, as both can meet on common ground in the association.

There is probably no greater opportunity for this work than among the street railway men, and in these days of consolidation and syndicates it should be comparatively easy to organize if the officials are ready. Local associations are generally formed, either at the request of the company, or on petition of the men. The company is generally asked to erect or fit up a building for the use of the men, and very frequently the men themselves will raise the money necessary for the furnishing. Whenever the local conditions are favorable a committee is organized to take charge. In many cases, however, this is not possible on account of the fact that the buildings are located at some distance from any local constituency.

Some of the helpful influences of the associations already in existence are seen at Rochester and New York, where 300 lunches are served each day, and where a pool-room, opened directly opposite the car-barn, has been put out of business. At Richmond, Va., the club house of the association is crowded night and day. This building contains a small, well selected library, the gift of Miss Helen Miller Gould. At Memphis, Tenn., the work has been so signally successful that the local secretary, Mr. Black, was invited to a meeting of the Newman Properties Association, and, as a result, the work at Birmingham, Ala., was started. This has been appreciated by the men. The rooms have been crowded, and the dormitories used extensively.

At Atlanta, Ga., a well equipped club house has been turned over to the Railroad Young Men's Christian Association, and an all-round association work will be conducted. At Sherman, Cal., an association was organized a few weeks ago, which now has 150 members. The small quarters set aside are already outgrown, and the president of the company has agreed to the erection of a building to be used for this specific purpose.

All the officials of the lines interested are most hearty in their commendation of the Railroad Young Men's Christian Association, and the presence of the men in great numbers frequenting the buildings is an indication of the way the employes appreciate the association. The thirty years' experience of the Young Men's Christian Association among the railroad men has demonstrated to all its adaptability to the needs of this class, and the very similar conditions among the street railway men make it possible for such a work to be carried on successfully for them. The international and state committees are ready to co-operate at any time in inaugurating these "homes away from home" for the men in the electric service.

The Columbus Railway & Light Company has recently equipped 20 of its cars on the Fair Grounds line with automatic street indicating devices.

SELECTION OF TRAINMEN.*

BY CLARENCE E. LEARNED, SUPERINTENDENT OF INSPECTION BOSTON ELEVATED RAILWAY COMPANY.

In accepting the request of the executive committee to present a paper on the Selection of Trainmen I felt keenly the responsibility of offering suggestions upon so important a subject to members of an association so familiar with its every detail. A brief investigation of the methods and practices of different roads disclosed the fact that the subject had already received so much serious and careful consideration in the past that it was difficult to suggest anything new. Many companies have adopted a general standard form of application, and similar, if not identical, methods of inquiry and investigation, and it seemed as though there was but slight opportunity for suggestion or improvement relative to either the questioning of applicants or the manner of examining into their character or previous employment.

The successful selection of men for railroad work appears to rest largely in the company's ability to create an interest in the mind of the applicant. No one can explain why one man will naturally take interest in one thing, while another is interested in that which is directly opposite, but it is certainly a fact that without interest little or nothing can be expected or accomplished. If a man can be made to become interested he will invariably develop a good memory regarding every detail connected with the work. The keener the interest the more likely is the person entertaining it to be successful.

Theoretically one can enter into lengthly explanations of what should be done to insure the successful selection of men, but what are the real conditions and facts surrounding the question, and what does the word "successful" mean to railroad managers?

All railroads are conducted to make money, and to railroad managers the meaning of the word "successful," as applied to trainmen can mean no more or less than those who can be depended upon to guard and protect the company treasury from loss by accident or theft from failure to register fares. In an endeavor to secure that which is so essential to the financial interests of those concerned, it would be well to consider what opportunities the department of employment has to obtain men who will accomplish this object.

Considering the responsibility of the position, it might be said that many of those applying, especially to companies in large cities, do not compare favorably with, and are below, rather than above the average of those applying for positions of equal responsibility and trust in other lines of work of equal grade.

This should not surprise us, nor should it be construed as to mean any reflection upon the service. The demand for men is so great on the larger roads that these companies are confined for the most part to the selection of men from applications of those living directly within their city limits. The nature of the work itself is largely responsible for so great a percentage of the undesirable element applying, inasmuch as it gives the men more opportunity to loaf or be absent from work than any other position they could obtain.

The opportunity for the country-bred boy to enter railroad work is such that it is simply a question of circumstances, whether he starts in the town or village where he is born, or leaves home to begin his career in some large city. The chances are, however, that he will start at home, and the conditions relating to ability and character of those applying might in consequence be just the reverse of that described above in the case of roads in the smaller cities. While these are the men so much desired by managers of roads in large cities, the opportunity to secure them seems to grow less and less each year. All railroad managers want good men, and while the young men who seek railroading for their life work might be considered ideal employes, those in charge of employment departments should not let slip any opportunity to secure the country-bred boy for the service, for he is the one most needed to bring up the standard of those applying for employment upon city roads.

The business of railroading is a specialty, and it is necessary for a man to possess certain special qualifications in order to become successful. To reach the highest pinnacle of advancement in the profession he must possess an ability equal or superior to that of those employed in almost any other trade or business.

The desire to learn a trade or become a merchant sometimes manifests itself in a boy at a very tender age, and is encouraged. In fact it is the aim and ambition of the parent to have the boy select that business for which he is best fitted, and every effort is made to secure a position in the best mercantile house of the particular business selected; or, if a trade is chosen, to apprentice him to the one believed to be the best, and throughout the boy's entire apprenticeship period the parent will, when possible, confer with his employer and advise and assist the boy to succeed.

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* Presented before the American Street & Interurban Railway Association, Columbus, O., October 18, 1906.

Merchants and tradesmen receive applications for employment from those who possess, or are supposed to possess, some special qualification for the trade or business selected, and the merits of the applicant for the work selected are demonstrated at an early age. This advantage the merchant has over the railroad manager, for even though the desire to become a railroad man might manifest itself in the boy as early in life as the desire to learn a business or trade, little or no opportunity exists in railroad work for the apprenticeship of boys, and parents, therefore, are liable to discourage rather than encourage such selection. The selection of men for railroad work, owing to the nature of the business, must be made from those who have reached their majority, and while this is a disadvantage to the young man who seeks work before reaching this age, there is a compensating advantage over the mercantile trade in the short time required for one to perfect himself sufficiently to earn a wage that exceeds that which he could earn at the age of twenty-one in many other lines of work.

For the purpose of bringing the subject before the convention in a manner that may lead to the suggestion of something new or original, it is well to deal with matters and conditions as they are, and it is hoped that the result will be accomplished in considering the "Selection of Trainmen" under the following heads:

Selection of superintendent of employment and assistants.
Office and waiting room of superintendent.
Conditions governing selection.
Inducing men to apply and analysis of those applying.
Qualifications deemed necessary and examination of applicants.
Selection of instructors and training and care of men selected.

Selection of Superintendent of Employment and Assistants.

The superintendent of employment should be a good judge of human nature, and be able to quickly and accurately determine whether the applicant possesses the essential qualifications required for the service. Time is a very important factor in railroad work, and while the superintendent should have the ability to quickly determine the possible fitness of the applicant, he should realize that the time given to the examination is profitably spent. He should possess such a personality as to inspire confidence and ease in the applicant, and thus secure more frank and accurate replies to questions asked.

The applicant should be impressed with the fact that the management is whole-souled and generous, and that if he secures employment he may be confident of receiving just and liberal treatment.

The assistants to the superintendent of employment should also be selected with as great care as the superintendent himself, and should possess, so far as possible, the same qualifications. They should by their manner, speech and judgment, in dealing with applicants, make clear in as simple a way as possible the duties of the position sought. One word hastily spoken might easily be so construed as to result in the discouragement of the applicant. Much depends upon these assistants, and as it is through them that the applicant must reach the superintendent, the detail of their work should be so arranged as to prevent, as far as possible, their showing partiality or favoritism.

A sufficient corps should be employed to make it unnecessary for applicants to wait an unreasonable length of time, as beyond the superficial examination the filling out of the application blanks is probably all that is necessary on the day of applying.

In the examination of an applicant regarding his reasons for applying and in asking pertinent questions pertaining to his previous employment, great care should be exercised not to offend, but the aim should be to leave the impression in the mind of the applicant that the position sought is of such importance as to require the most searching investigation and examination. Every effort should be made to dispel that feeling which might be uppermost in the mind of the man applying, that he is begging for a position. He should be led to feel that the company desires men such as he quite as much as men such as he desire the position, that appointments are not made through favoritism, but wholly upon merit, and that the matter is strictly a business proposition, and if his references prove satisfactory he will be employed; thereby causing him to feel as ready to offer himself for a position on the cars as he would offer to sell the company merchandise. Start a man right and little or no encouragement will be necessary to interest him in what follows:

Office and Waiting Room of Superintendent.

In order to produce a favorable impression upon the applicant the office of the superintendent of employment should be attractive and well appointed, and the fittings and furniture should be in keeping with the general offices of the company. Waiting rooms in connection with the office should be equally well appointed, and devoid of all "cattle pen appearance." Settees should be so comfortable that the time spent by an applicant while waiting may not result in his becoming discouraged and discontented. Fit up waiting rooms in such a manner as to bring them, if possible, above the standard of the man desired rather than below. The importance of this room has probably never had the serious consideration that it deserves, and the fittings and atmosphere surrounding waiting rooms in general have undoubtedly been the cause of many good men hesitating to enter, and have, perhaps, resulted in their not applying for employment.

There might be pictures of car-houses and cars for applicants to study. In order that they might see the advancement of car service men, there might be large pictures of conductors, motormen ,starters, station masters and inspectors. Tables of rates of wages, as determined by length of service or position, might be shown, and prominent display might be made of any special rewards, life or accident insurance, and the retirement on pension if such exists.

Conditions Governing Selection.

Many general employment agencies are successfully and profitably managed by men of far less experience and ability than those selected to manage a department of employment for railroad service, and while these agencies are as exacting regarding the requirement of references, and as thorough in their investigation of the character and previous employment of the applicant, their opportunity for success is tenfold that of a railroad superintendent of employment, as they are simply required and expected to furnish information regarding the applicant's previous experience or fitness for the position sought. As a majority of the applicants for service upon the cars have had no experience whatever in railroad work, there is little opportunity for the one in charge of the employment department to obtain any knowledge of their fitness for the position sought, and success in appointing proper men depends largely upon those applying. Conditions sometimes force the selection of men known to lack some of the qualifications desired, and the merits of the men selected differ widely, even though those who are responsible for their hire have in mind an unvarying standard of excellence.

Supply and demand are strong factors, and the quality of the men selected is greatly influenced by the number of men applying. If the demand is for a greater number than those who come within the requirements it necessitates the selection of some who fail to qualify in minor details of examination, and in consequence men of inferior ability sometimes find their way upon the cars. When found necessary to hire men knowing to be lacking in some of the particular qualifications set, is a proper effort made to communicate these facts to the one selected to instruct them? In order to prevent such men from becoming unnecessarily discouraged and dissatisfied, and to make successful men of them, they should receive special training and care after appointment. To aid in this it is suggested that a qualification card be adopted upon which should be plainly set forth the particular points in which the superintendent of employment considered the applicant deficient. It would be an advantage to both the company and the man to have these facts known to the superintendent of the division to which the man was assigned, he to select such an instructor as would be best fitted for the particular attention desired.

Inducing Men to Apply and Analysis of Those Applying.

It has been repeatedly said that the best are none too good for railroad service, but can it be said that any regular defined system or method has been adopted by railroad managers to obtain the best help the wages paid by them will hire? To be successful in inducing desirable men to apply they must have their attention called to the service in a manner that will impress them favorably, and the only way open to large street railways seems to be through the medium of the press, as personal solicitation is out of the question for corporations hiring such large numbers of men. It might be as desirable and beneficial to railroads in large cities to handle this matter just as concerns engaged in mercantile business do. Everything, however, would depend upon the skill with which it was done.

One way to reach and attract the most desirable men would be for managers to make up a list of the towns from which they had hired men for perhaps a year previous, and for the papers in these towns to publish a short and interesting article regarding the man that the company had engaged from among their readers. This would lead others acquainted with those who had gone into the car service to apply, encouraged as they would be by the fact that success was equally as possible for them as for those they read about. It would also dispel the thought that when away from home they would be among strangers and unknown.

Matter regarding the opportunity of advancement in the car service might be incorporated into the personal notices above referred to, and in this way bring out what the company desired in a manner more forcible and effective than an ordinary advertisement or a general article on railroad affairs.

The statistics of the Boston Elevated Railway Company for the year 1905 are of considerable interest, for they show how large a number of applications have to be considered in order to obtain even a moderate number of suitable men.

Out of 8,000 applying only 5,000 were permitted to sign applications.

Out of 5,000 signing applications only 2,000 were accepted.

Out of 2,000 accepted only 1,750 were assigned to duty.

Out of 1,750 assigned only 500 were in service at end of year.

Of the 3,000 not permitted to sign applications, 1,800 were rejected on account of defective eyesight, 400 on account of lack of education or limited knowledge of the country, and 800 on account of undesirable appearance and evidence of liquor.

The cause for the loss of 3,000 men after signing applications was due to the following reasons: 1,800 rejected on account of unsatisfactory references, 600 on account of being ex-employes with poor records, and 600 failing to respond to notice of appointment.

The loss of 250 after acceptance of application was due to rejection on account of physical examination.

The reasons for 1,250 not remaining in the service for more than a year was due to the following: 150 failed to qualify, 525 resigned, and 575 were discharged.

From these results it might be said that the stringency of the examination before admitting men to the service resulted in only the best of those applying being appointed, but as only about 30 per cent of those receiving positions remained in service over a year it does appear that outside of the small number failing to qualify the importance of the examination was not fully appreciated by those accepted.

It is not the desire of the writer to suggest in any way the lowering of the standard set, but it does seem as though something should be done to induce better men to apply, and if the above figures are a fair comparison of the results of other roads it would certainly give rise to the thought that only a few of those applying realized the responsibility or the importance of the position, and judging from the personnel of many of those applying, coupled with the results obtained, it is evident that they were also of the impression that there was little or nothing to learn about railroad business, and that the most common or ordinary man could fill the position. To overcome this impression and induce those believed best fitted for the service to apply appears to be a matter that might well be considered, and it does seem as though some plan could be devised by which it could be brought about.

The business of railroading is, to say the least, peculiar, inasmuch as it has opportunities at all times for the employment of men, and the knowledge of the fact that applications would be received at any time might cause one to try all other opportunities first and leave the application for railroad work to the last. To bring about the consideration of a railroad position before that of any other, every effort should be made by railroad managers to reach the unemployed with information regarding the wages earned in railroad service. In this particular it might be said that the advisability of paying learners a nominal sum while breaking in would be well to consider, as men seriously thinking of applying for a railroad position calling for apprenticeship might hesitate to give up ten to fourteen days to learn the business, and in view of this it seems as if it would work to the advantage of the company as well as the man if he receives some compensation for his time.

Qualifications Deemed Necessary and Examination of Applicants.

The requirements of the service demand as efficient men as those of any trade or profession, and to be successful in selecting those best fitted to give satisfactory service it does seem that more than the simple mental, physical or moral qualifications of the applicant should be considered, and besides obtaining a thorough knowledge of their character and previous employment, information as regards the wages previously earned, manner of living, as well as those dependent upon them should be obtained, with a view of determining their ability to meet their expenses with the wage of the position offered, as only those who could earn sufficient to meet their expenses could be expected to remain in the service, be satisfied with the work or do justice to the position, and without doubt the best man for the place is the one who has earned a less amount than that paid, as he would at once think that he was doing well and be perfectly satisfied with the position; while the one who had commanded a higher wage would soon believe that his services were not appreciated, and be quick to cause dissension by criticising orders given, or by belittling the ability of his superiors.

While it might be said that railroad managers were of the same opinion as to the proper man for the service, it should be borne in mind that the peculiar qualifications so necessary for railroad work cannot be determined or discovered by examination. Disposition is a most necessary and important factor, and the desire for the position makes it difficult and at times impossible for the examiner to detect the actual temperament of the applicant. The ideal trainman is the one with the right disposition. The man of unquestionable reputation and character might be unfitted for the work because unable to successfully cope with the conditions so common to the service, and only the one who has sufficient strength of mind to be able to quickly control himself at all times, use judgment, be loyal, obey the rules, appreciate his position and conscientiously consider the wishes of his superior, is in the mind of the writer the suitable man for the service.

It appears that these qualifications can only be demonstrated by actual test of applicants in service, and in view of this fact it can only be satisfactorily determined after a period of probation. The requirements established for men for train and car service should be of sufficiently high standard, both mentally and physically, to exclude the employment of men who are not capable of performing the duties of the position. The best possible service must be maintained in order to hold the good will and respect of the public. The growing tendency to introduce the merit system, fixed systems of promotion, and mutual benefit associations and establishment of pension funds is evidence in itself that the work of the railroad man is appreciated by the higher officials.

All companies fully realize the importance of permanency of employment and the entrance of street railroad work as a life occupation, and have consistently been bettering the conditions and increasing the wages of their employes.

The system of examining men has been very complete, but an analysis of the results obtained should to a great extent enable one to judge of the success of the present system.

The examination of applicants should not be confined to written answers to questions or printed forms, but applicants should be brought in close contact with the examiner, and in conversation demonstrate, as far as may be, their fitness or otherwise for the position. The superficial physical examination should show whether an applicant has any deformities, his use of liquor or excessive use of tobacco; also whether the applicant appears bright and alert, or dull and slow in his mental processes. Although a more or less elaborate plan can be mapped out for examination, it cannot be followed at all times, as the ratio between the number of applicants and the number of places to be filled governs the extent to which discrimination may be judiciously carried. The superintendent of employment must necessarily select a sufficient number of men from those applying to keep the ranks filled, and as a result he does his best to secure those who can be trained to be good railroad men.

The examination of applicants should disclose a reason for applying, and whether the applicant intended to make the service his permanent or temporary occupation, as a knowledge of these facts might influence the severity of the physical examination.

An applicant applying on account of a desire to change from indoor to outdoor work might feel at the time of applying that he simply desired to make the change temporarily on account of his health, and a rigid physical examination would show that he was in poor physical condition. This condition, coupled with nervousness, would be likely to result in his being rejected, and the company in consequence might lose a man whose general ability was far above the average. If the cause of his state of health had been considered, together with the length of service desired, it might have resulted in his being employed, and with a probability that the work would be so beneficial that he would finally determine to make railroad service his life work.

The medical examination now in vogue may not be too severe for those desiring permanent service, but it seems wise to consider the intended length of service of applicant in determining the severity of the examination.

Selection of Instructors and Training and Care of New Men.

Much depends upon the manner in which the rules of the management are first explained, and to secure good results care should be exercised in the selection of instructors. Instructors should be chosen from the most practical men in the service, otherwise learners who by their natural gifts or education are capable of succeeding might often fail, as result of indifferent instructon. To produce a perfect and finished article, even from good material, it must be placed in the hands of competent workmen, or unsatisfactory results are sure to follow.

It may be assumed that everyone applying for a position in the railroad service, whether it be temporary or permanent employment, is desirous of becoming proficient and will exert every effort to succeed, but it is perfectly clear that with all the pains a learner may take, however carefully he may prepare himself, he is sure to make mistakes, and to prevent such mistakes from discouraging a beginner and causing him to become dissatisfied with the work, care should be taken by superintendents, as well as instructors, to explain that these mistakes are to be expected, and if not too frequent they should not be taken too seriously.

Are railroad men born or are they made? And, while it might be said that there were born railroaders as well as born artists, it is without a question a fact that they are fewer in number; but why should not the railroad profession have as many successfully made men as that of any other profession?

While an almost absolute uniformity prevails among the different roads as to the selection of men, can the same be said as to their manner of training? The ability to retain men may be partially due to the success in training, and lack of proper training may cause the loss of many men.

The superintendent of employment can form but a general opinion as to the ability of the person appointed, and it then devolves upon the instructor to demonstrate the applicant's fitness for the work.

The expense incurred by the superintendent of employment previous to the appointment of an applicant warrants the expenditure of a still further amount in order to have the applicant properly taught and instructed, especially when expended upon a man who has successfully passed every test and examination up to the point of his being assigned.

The selection of instructors and the manner and plan of instructing should be as thorough as the selecting of the applicant, and the use of forms and blanks are fully as necessary for instructors as for those entrusted with the appointment.

The importance of teaching new men has lately received special recognition by the Boston Elevated Railway, for within the past six months over two hundred men have been selected for this special purpose, and their wages increased 10 cents per day, and with such astonishing results that possibly the subject warrants more detailed explanation.

Conductors and motormen specially qualified to instruct have been selected from each division of the road, and the importance of the work was deemed so great by the management that the president personally explained to the men just what was expected of them, and with such good results that since the inauguration of this system very few men have resigned while breaking in, and few have been rejected on account of incompetency.

Much depends upon the ability of these instructors, and consequently great care should be exercised in selecting them. Those with ability and no patience should not be chosen, for instructors must possess sufficient patience to dwell at length and with care upon all points in which the new man appeared deficient. They should have tact to overcome any discouragement that may arise, and sufficient ability to interestingly describe and demonstrate the work so as to make the applicant feel at ease and in condition to perform his duties without difficulty and with as few disagreeable features as possible, leaving him at the close of the day's work with a feeling of gratitude to his instructor for the patience and interest taken in his behalf.

INTERURBAN FREIGHT AND EXPRESS.*

BY EDWARD C. SPRING, GENERAL SUPERINTENDENT THE DAYTON AND PIQUA TRACTION CO., WEST MILTON, OHIO.

The recent enactment of legislation in many of the eastern states favorable to the handling of freight and express matter by electric lines has caused the operators of such roads as are affected to inquire into the feasibility of establishing a freight or express business on their lines. Hitherto the handling of trolley freight has received comparatively little attention in the east and considerable less in general than the attention given to it in the Middle West. Massachusetts interurban railway companies have recently been granted permission by the railway commissioners to engage in the freight business. A similar action has been given in favor of the interurban systems of New Jersey. The Massachusetts legislation has established a very liberal policy to permit street railway companies to carry freight in order to afford additional facilities for the transportation of merchandise and farm products, thus giving to the people in localities where steam railroad facilities are limited a decided boom. Naturally eastern operators are looking to the interurban lines of the Middle West for a solution of this problem, where freight and express services has been in operation for some time, but, as a fact, the roads of the Middle West have not fully demonstrated or satisfied themselves as to the best course to be pursued in taking care of this new branch of the service.

A diversity of opinion exists among the managers of the electric roads, whether it is more advantageous to handle merchandise at express or freight rates. Each manager has his own personal opinion and ideas along this line and in summing them up, we cannot but see that each man's opinion is based upon peculiar circumstances prevalent to his own property. The steam roads of the country have the advantage over the electric lines in this respect, as their conditions are more of a universal or standard nature.

In looking over statistics in regard to the handling of freight and express matter, the diversified conditions that exist among the various roads and the difficulty in harmonizing those various conditions, presents a situation each operative manager must decide for himself. One of the problems that presents itself is the difficulty in drawing a distinct line between freight and express traffic, as handled by electric roads, for the reason that the freight branch of the business has not developed sufficiently so that a point of difference can be made between freight and express traffic.

The word "freight," as applied to steam roads, cannot, in its literal sense, be applied to the electric lines at the present day. To do a freight business in its literal sense, means the handling of freight in carload lots by trains. The number of roads in the country today equipped for such service with sufficient length of track to make the same of a profitable nature is very small. Our power stations are not equipped for this extra heavy service, neither is our rolling stock sufficient or physical conditions of our track in shape to withstand the wear and tear of such service. In view of these facts, which are all well known to you, the various roads must confine themselves to light freight and express service, and it is useless for us to think of competing with steam roads in handling freight in carload lots at this time. But the handling of light freight and express has been so successful that the question of handling carload lots is being seriously considered and has been successfully accomplished by a few roads, but a carload freightage over connecting lines is a problem yet to be worked out. A universal interchangeable freight traffic and the pro-rating with the steam roads are two matters which the officials of the steam roads have, up to the present time, been reticent in entering into with the electric lines, although few of the smaller steam roads have entered into traffic arrangements with some of the electric lines.

The growth of the freight and express business during the past four years has been wonderful. The frequency of service and the connecting of small towns between cities hitherto isolated from the outside world have been two of the greatest factors for the development of this branch of the service. The handling of fruit and garden truck, on account of the dispatch of carrying these perishable goods, is fast becoming a source of revenue to interurban freight handlers.

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* Presented before the American Street & Interurban Railway Association, Columbus, O., October 18, 1906.

The number of advantages offered by the electric lines in the handling of commodities is fast becoming more apparent each day, each road having its own particular line of goods which it derives the greatest part of its revenue from. The placing of the farmer in close touch with the market of the civilized world through the medium of the electric lines, offers in itself one of the greatest inducements to the interurban lines running through a farming community. In handling this class of business each company should be provided with ample equipment to handle all business offered it daily without difficulty. Motor cars should be so equipped that trailers could be handled without delay. Each company should have several box-car trailers to take care of carload business, in addition to the handling of local freight. The handling of merchandise with trailers as much as possible would serve to hold down the operating expense of the department. Freight stations and platforms erected along the line to stimulate the traffic and enable the handling of freight more carefully and with greater dispatch and also makes a convenient place for the transfer of the merchandise to the teamsters. In all cases we must offer the same inducements to the shippers as are prevalent with the steam roads. Competent men should be in charge of these stations who should be intelligent, sober and industrious, because these agents come in close contact with the public in the freight department, the same as they do in the passenger department, and in a marked degree the success of the company is dependent upon these representatives. Agents should be conversant with the freight tariff, so that they can immediately quote any desired rate to the shipper and give any information sought for the forwarding of goods from any local point to a destination on a connecting line. The interurban freight stations at Cincinnati and Indianapolis afford two of the best object lessons in the handling of freight at large terminals.

All matters pertaining to increasing the outlay in the freight department should be made in an exceedingly cautious manner. The dispatch and promptness in handling merchandise by electric roads will bring better results than any other factors, but the question comes, how shall we handle this class of business in the most economical and efficient manner so that the operating of this department will not eat up all the profits which incur from the business.

I believe that there is great need of revision in the manner of handling the freight and express business among the major part of the companies through the Middle West. The jealousies which exist between the companies must be done away with and the hearty co-operation of all roads to one end of serving the best interests of the electric lines must be pre-eminent. The reconstructing of the physical conditions of our properties to meet this branch of business must as well be taken into consideration. Above all things, I would not, for a moment, encourage any road to go into the freight or express business to the detriment of the passenger service, although I do predict that the freight branch of the service has a wonderful future. I do not believe that the day will ever come that the freight business will supersede the earnings of the passenger traffic until all the independent roads have consolidated, operate upon private way and with double track. I do not believe that any good road can honestly afford to interfere in any way with the revenue of the passenger department.

The road that serves the large manufacturing and commercial centers where the consignee demands his goods at a given time and whose business warrants his paying well for the prompt delivery, can do an express business, charging express rates upon a profitable basis, but to engage in a freight business on freight rates under these conditions would be suicidal to the company. On the other hand, any road that operates through a farming district and caters to the demand of the farmer, to whom time is of a very small consideration, an express service would be entirely out of the question and only a freight traffic with the lowest possible freight rates should be considered. The farmer has not yet thoroughly realized the advantages which the interurban facilities afford, and charges in excess of the present steam road rates are severely questioned. The merchants in the various farming towns, knowing that the farmers will not pay anything extra for quick service, are equally unwilling to pay more than present steam roads charge, and the only way that the electric railway company can hope to obtain a local freight business under such conditions is to place its rates on a parallel of those of the steam roads. Nevertheless, there is no doubt but what, in many instances, the handling of heavy freight through these farming sections can be made to show a fair return if properly conducted. Tobacco, corn, wheat and oats can be successfully handled to a profit under many conditions. A road operating through a farming community installing freight buildings, built exclusively for this purpose, offers a very attractive feature, inasmuch as the road can receive large consignments and deliver them at its own pleasure, thus oftentimes being able to compete with the steam roads, the freight-house taking place of the freight-car capacity of the steam roads.

I think that the disposition on the part of the electric lines to follow steam road methods, representing, as they do, years of experience, is an excellent one. I would not, for a moment, recommend any cut below the steam roads or express traffic, particularly between competing points. We have a chance now in this comparatively new field of the service to maintain a standard of rates and not again experience a condition of affairs the same as we have experienced in the passenger business and later be obliged to change our rates. The drawing of the line between the freight and express business is one which must be decided by the operator. I do not believe that an express service on a short line can be maintained as profitably by the railway company itself as it can be by a regular line express company operating over connecting lines, and again, I would cite the experience of steam railways in this respect.

After the division of rates among the various companies the percentage that would revert to the company that originated the business would be so small that in many cases business would be done at a loss. One of the greatest expenses in the maintenance of the through express business is the delivery and collecting by wagons. There are very few places on interurban roads where the companies can afford to maintain regular delivery wagons. The only possible way to maintain an express service under conditions that do not warrant the maintenance of wagon service is to make arrangements with local teamsters along the line to handle the merchandise between the car and its destination. Many roads have endeavored to maintain such a service, but have been obliged to discontinue it and transfer their business to some electric express company organized for this class of work. One of the best examples of this class of service is the magnificent system of the Cleveland Electric Package Company, which handles the most of the merchandise carried over the electric lines in and out of Cleveland. This system is a positive proof of the best manner in which to handle a strictly express business. The Southern Ohio Express Company, operating between Dayton and Cincinnati, offers also another demonstration of the feasibility of turning all express matter over to a regular express company.

In adapting a line of operation, each manager must be governed almost wholly by the local conditions ,not only to his property, but those connected with him and judge for himself the best line to work upon. I believe that the roads throughout the country should look towards the standardizing of the freight and express business, the same as we are endeavoring to standardize our equipments, and if the problems are adjusted we should see the results in cheaper operation and increased revenue. Already the interurban freight radius has grown from the distances between the towns and villages to hundreds of miles. Realizing that this phenomenal growth has taken place within a few years, it is within the bounds of possibility that in the future railway builders will so construct electric lines that they should rival, to a great extent, steam power systems in their capacity for hauling long distance freight. And as the industrial and commercial needs press the interurban people to keep pace with the demand for greater freight transportation, this need will be met in the same energetic and progressive manner as has characterized the past developments of passing transportation.

In summing up this article, I have not tried to go into detail at all, or statistics, as that would make too lengthy and tiresome a paper. I have simply looked at the plain facts as they have presented themselves to me in careful observations of the various lines in the Middle Western states. I have not touched upon the classifications of accounts, as this is an independent subject within itself. I would not discourage any road from handling heavy freight, because the standard electric equipment is only able to take care of shipments in less than carload lots, which is practically express. However, since the advent of some of the later forms of alternating current motors, electric roads may be equipped for handling freight. Taking into consideration the power of a freight locomotive, which is from 600 to 1,000 horse-power, such a current thrown on and off at some of the power houses would only meet with disastrous results. While an old road may be equipped for the handling of heavy freight, the expense of equipment would not be justified by the amount of business that would be handled. A good many electric roads which are handling freight use a steam locomotive with good results. Too many roads figure on high freight rates, while, as a matter of fact, they can get but little more than the steam roads; people are not after quick delivery on freight; that is express. The smaller steam roads are getting near four cents per ton-mile, while the larger roads are getting between one and two cents, so that an electric road would have to handle a great deal of business to make money at this rate. The steam locomotive offers the best solution for most of the roads built, about half of which could operate a light locomotive by changing a few grades, curves, etc., while some roads are built on steam road standards in the country, track construction in the city prevents operation even if city ordinances do not prohibit it.

You will pardon me if I have been too severe in my comment upon the freight and express branch of the service, but being in a position as I have been and watching the operation of it in the Middle West, I cannot help but feel that there is a tendency to over-estimate this branch of the service to the detriment of our passenger business.

UNIFORMS AND BADGES.*

BY JOHN R. M'GIVNEY, PURCHASING AGENT NEW ORLEANS RAILWAY & LIGHT COMPANY.

The subject of uniforms and badges is a very interesting one. The uniforming of employes is one of the progressions of the street railway business made necessary by the change from the old horse-cars to the modern electric palaces in operation today. No street railway company at the present time, whether large or small, would think of allowing employes to work on its cars unless fully uniformed, and there is nothing that will catch the eye of the patrons of a railway system quicker and cause more unfavorable comment than an untidily dressed employe. When you come across a company that has its motormen and conductors wearing a white collar and a clean, neat uniform of one pattern and color, you know these men are taking a pride and an interest in their work, and you can also put it down that the manager of this railway has his men fully disciplined. There is a great deal that could be said on these lines, but more attention has to be paid to the inspection of uniforms by the manager in one section of the country than in another. In one section, where there is a long, cold winter, and the men have their overcoats buttoned up nearly all of the time, very little of the uniform proper shows. In another section—especially in the South, where the cars are vestibuled, both front and back—the men are exposed very little to the weather, and their uniforms show most of the time, and more attention has to be paid to them ,and an important question arises as to the best course for the railway company to follow in order to obtain the best result in keeping its men neatly uniformed. Where the men select and purchase their own uniforms, and have to pay cash for them, they invariably purchase them at the place they get them the cheapest, overlooking altogether to examine the quality of the cloth, or, perhaps, they do not know the difference in cloth. If the uniforms are bought very cheaply, of course they are not going to get good ones, which means they will only get half the wear, and necessitates their buying double the number of uniforms they should buy in one year. When the superintendent gets after them to purchase new ones on account of their old ones being worn and not presenting a good appearance, you will find that some of them feel that they should not be expected to purchase more than two whole uniforms a year, and, in fact, have not made provision for more, and cannot pay for them, so that if the superintendent insists and wishes to keep these men, he has to arrange for the advancement of part of their salary to procure the new uniforms, or the company has to stand good for them at the clothing house. Here is where there is no end of trouble unless the men are confined to purchasing from one or two uniform houses, and even this is very unsatisfactory, as it is necessary to see that the employes pay the clothing house.

In my opinion, the railway company can obtain better results in keeping its men neat and tidy if it will help them by purchasing their uniforms and allowing them to pay the company for them in three or four payments. For instance, in New Orleans the men are privileged to buy their uniforms wherever they please, but they must conform to the uniforms adopted by the company in regard to style and color, but each year the company solicits bids for both winter and summer uniforms for conductors and motormen. These bids are made according to the company's specifications and are accompanied by sample uniforms and caps, and are required to be in the office by a certain specified date. The purchasing agent then removes the tags of the makers of the uniforms, and each uniform maker is given a lot number, from number one up, and one of the best tailors in the city is then called in to closely inspect and select the best summer and winter uniforms as to cloth, workmanship, etc., conforming to the specifications. When the bid is awarded there is a notice posted at each barn notifying the men to whom the company has let the contract, and at what price. As previously stated, the men are not compelled to purchase their uniforms through the company, but they are, from practical experience, convinced that the company can get a lower price and a better piece of goods than they could. Care should be taken in awarding the contract to see that there is embodied in it the stipulation that the uniforms must be first-class in regard to workmanship. It is almost impossible to avoid at times a bad fit, or the furnishing of a uniform with bad sewing, in which latter case the uniform is torn or split in less than a week. In all such instances of improper fit or workmanship the contractor must mend, renew, or adjust the fit of the garment to the satisfaction of the purchaser without bothering the company.

When an employe needs a uniform he is given an order on the firm that has the contract, and, after he is fitted he signs a bill which, on his signature, the company pays. He is then allowed to pay for the uniform by having $2.50 deducted from his salary each pay day until the uniform is paid for. We find that more than 90 per cent of the employes avail themselves of this opportunity to purchase their uniforms through the company instead of buying them direct from the maker themselves and paying cash. Allowing the men to pay for their uniforms on such easy terms insures their nice appearance, as there is no trouble about getting them to purchase new ones when necessary.

To keep the uniform account accurate, a uniform ledger is kept by the company, and the charges are posted from the signed bills rendered each day by the contractor. The order for a uniform is only good on the day it is issued, and if for some reason, the recipient cannot have it filled on that date it is necessary for him to come back to the office and get a new one on the date he desires to have it honored, as the contractor will not accept it on any other day but the one on which it is issued, so that there are no orders held out by the men, and the bookkeeper is always able to tell the paymaster or cashier what an employe owes in case he is leaving the service of the company and a settlement is to be made with him. There is a column on the payroll for the deduction for the uniforms, and as long as an employe's account is open the uniform bookkeeper puts down $2.50 along side of the amount due him, which is deducted by the paymaster and the amount credited to his uniform account. This is a very simple and satisfactory way to keep the uniform account straight.

The company requires the conductors and motormen, before they are finally assigned to a position, to deposit a cash bond of $25, on which it pays them 4 per cent interest per annum. This guarantees the company against any loss on the uniform account; also in the collection of its money by the conductors.

The uniform buttons are made of brass with initials of the railway company only. These are furnished by the company and remain the property of the company. When an employe leaves the service he must turn over his badge and buttons before a final settlement is made with him.

The uniform cap for the winter for conductors and motormen is a blue cloth with spring top and black turned down visor, and is provided with rain cover. A black or brown straw cap with bell crown, with ventilator holes near the top and black turned down visor and rain cover is designed for the summer.

What has previously been said about the motormen and conductors looking neat and tidy applies more particularly to street aids (inspectors), transfermen, starters and barn foremen. They should be dressed in a neat uniform of the same color and style as that of the conductors, without the reinforcement of the pockets of the coat. A silk cap should be worn with this, and a badge to designate their office. A good street aid or barn foreman, in full uniform, which shows his authority with the company, commands the respect of the public in big crowds, delays to the line, and in all cases of trouble of any kind, and on such occasions he can accomplish more good for the company than any five men without uniform. Besides this, having a street aid uniformed and stationed around the city, watching and checking up the lines or riding over them, demonstrates to the employes and convinces the public that the railway company is having an eye to its business, and is giving it the attention it must have in order to operate with as little complaint as possible.

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* Presented before the American Street & Interurban Railway Association, Columbus, O., October 18, 1906.

The railway company should use every means in its power to assist its men in keeping their uniforms clean. In winter, when the front part of the car is inclosed and the line operates through dusty streets, the car creates a vacuum and the dust is all drawn into the back end of the car, and unless the conductor keeps the back door closed the passengers are annoyed by it, but there is no escape for him, and when he reaches the end of the line he is covered with dust. This may, to a great extent, be remedied by a continuous sprinkling of the street and by providing each car with a whisk broom, in order that the men may brush their uniforms.

In regard to the badge question, the cap badge is the one universally worn, and it is a matter of choice with different companies as to what style to adopt and as to the material of which the badge should be made. The solid metal badge is too heavy and bright metal tarnishes very quickly and unless it is kept very clean and bright it is hard to distinguish the number, which is a very essential feature, as the badge number of both the conductor and motorman should be plainly displayed to the view at all times. One of the very best badges I have come across for wear and also for lightness, is a celluloid badge with an aluminum back with white lettering on a black background for conductors and black lettering on a white background for motormen, the number in the middle, name of the company on top and the words motorman or conductor at bottom, using even numbers for conductors and odd numbers for motormen. The number and letters on the badge can be plainly seen at all times, as there is nothing on it to tarnish and there is no way to deface or damage it, except in an accident or with malicious intent.

For street aids, foremen, starters and transfermen, a black ribbon, with gold braid letters, with small piece of elastic sewed to the ends of ribbon and fitted over the silk cap ,make a neat badge, which adds to the appearance of the uniform.

It would be difficult to select a general specification for an overcoat, relative to weight of material and style, which would be applicable to all sections, as conditions differ in the cold and warm sections of the country, and much depends upon whether or not vestibules are used on the cars. Of course, as to the color, it should correspond with that of the uniform.

After going over a number of specifications of the different railway systems of the country, I have selected the following, which, in my judgment, would make the best uniform for summer and winter service:

Specifications for Winter Uniform.

Uniform to be made of best blue, 22 or 24-ounce (as referable), Middlesex cloth or its equal.

Motorman's coat to be double-breasted; conductor's coat to be single-breasted, ⅜-inch, double stitching and lined with double warp Italian cloth or some lining equally as good. Coat pockets to be made of extra heavy duck and reinforcement around outside of all pockets.

Vest to be single-breasted, with six buttons and notched collar.

Trousers to have top front pockets, watch pocket and two hip pockets.

Buttonholes to be made with pure dye silk.

A set of detachable black buttons to be furnished each coat and vest.

Cap to be of blue cloth, with spring top, black turned down visor and rain cover or navy blue Scotch havelock, depending on locality.

Uniform to be first class in every particular and any defective workmanship or material to be repaired or replaced, as the case may be, without extra cost to purchaser.

Sample of uniform and cap to be furnished by each bidder and those of the bidder securing the contract will be kept in the office of the superintendent during the continuance of the contract.

Specifications for Summer Uniform.

Uniform to be of the best 13-ounce Middlesex flannel or its equal.

Coat to be single-breasted, ⅜-inch, double stitching, skeleton- lined, with black Italian cloth or lining equally as good. Pockets to be made of extra heavy duck and reinforcement around outside of all pockets.

Vest to be single-breasted, with six buttons and notched collar.

Trousers to have top front pockets, watch pocket and two hip pockets.

Buttonholes to be made with pure dye silk.

A set of detachable black buttons to be furnished with each coat and vest.

Cap to be of black straw, with bell crown and ventilator holes near top, with rain cover.

Uniform to be first class in every particular and any defective workmanship or material to be repaired or replaced, as the case may be, without extra cost to purchaser.

Sample of uniform and cap to be furnished by each bidder and those of the bidder securing the contract will be kept in the office of the superintendent during the continuance of contract.

DISCIPLINE OF TRAINMEN.*

BY F. W. BROOKS, ASSISTANT GENERAL MANAGER DETROIT UNITED RAILWAY.

I have learned in my experience in railway work, discipline among trainmen is not possible except where discipline is recognized as a cardinal principle, and is applied in every branch of the service and to every one from the highest to the lowest. Discipline is the surest guarantee of order and safety in the operation of a railway, insuring, as it does, the confidence and respect, not only of those engaged in the operation of railways, but also of the public whom we serve. Call to your mind today a prosperous railway property and you will find that, underlying its prosperity, discipline has been established and is being maintained.

Discipline should be an ever present potent factor. It should impress itself upon the youth who first enters the service. It should be of such a character as to command the mutual respect and confidence of the officers and employes for each other. It should be of a character that will withstand disaster. It should evidence itself to the public through the courteous and manly bearing, under all circumstances, of all of those in the service. When such a state of discipline is maintained the "Discipline of Trainmen" becomes a problem of comparatively easy solution.

I appreciate that on this subject managers entertain different views as to the best methods to be applied, but all strive to attain the same result. I am connected with a railway property comprising 617 miles of track, of which there are about 400 miles of interurban track. To conduct the service requires superintendents, dispatchers, station agents, car-house foremen, and approximately two thousand trainmen.

With us, trainmen upon entering the service are at once subjected to discipline. An application must be filed, which must contain such information concerning the applicant, as the company is entitled to possess; five references must be given, and if the applicant and his statement appear to be satisfactory to the officer whose duty it is to employ trainmen, he is assigned to a division, on probation, to begin his practice; the probationary period continuing for ninety days. During this period his previous record and character are carefully investigated, and if found satisfactory he is then accepted as a regular employe, otherwise he is dropped from the service.

Upon entering the service each trainman is provided with the company's book of rules, by which rules he agrees to abide. These rules cover the standard regulations governing the service, and require that the bulletin board be examined daily for additional instructions. If additional instructions have been issued, each trainman is required to acknowledge in writing within twenty-four hours after the bulletin has been issued that he has read and understands the instructions—otherwise he is not permitted to take out his "run."

If the instructions are not understood by a trainman, he must apply to his superintendent for an explanation, and it is the duty of the superintendent to make such an explanation carefully and fully.

We use the telephone for transmitting train orders. Trainmen are required to apply to the dispatcher for orders, and are prohibited from engaging in any unnecessary conversation. The use of the telephone line is limited to the transaction of the company's business, and abuses are regarded as violation of the company's rules.

Trainmen are prohibited from discussing the company's business with passengers or the public. The motorman is enclosed in a vestibule or cab, and not permitted to talk with passengers at all. The conductor is required to give to passengers such information as they are entitled to have regarding rates of fare, routes, time of trains, connections, and like information. Trainmen are required to be courteous to all patrons and the public, and it is our aim to rigidly enforce this rule. They are not permitted to go on duty except that they are in full uniform, and must at all times present a neat appearance. The use of intoxicants, obscene language, or to engage in gambling at any time, is cause for dismissal.

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Trainmen are provided with comfortable quarters at their respective headquarters, and must report for duty ten minutes before their runs are due to start. Our rules require that trainmen shall thoroughly understand the system of dispatching—signals of all kinds, whether train, semaphore or signals displayed by the car or track and bridge departments. They are also required to know the locations of fire department houses, and to listen for and understand the signals given by fire apparatus when running to fires. They must also know the location of school buildings and churches and in passing exercise special caution to avoid accidents.

I have mentioned these general regulations for the purpose of showing the conditions under which our men operate. Our discipline is designed to maintain respect for the rules and regulations, and our method of supervision is such as to bring to the notice of the management any violation on the part of trainmen of any rule or regulation.

When a violation is charged, the offender is required to report to our assistant general superintendent, who conducts an investigation to ascertain all the facts bearing on the charge, and who is authorized to take such action as in his judgment is warranted. If his finding is questioned by a trainman who is charged with the violation of a rule, then an appeal may be taken to the manager, from whose decision an appeal may be taken to a board of review, presided over by the president of the company.

This method is designed to afford protection to both the employes and the company. It relieves the subordinate officers of the duty of inflicting punishment, and insures the application of a uniform rule. Except when an immediate discharge is warranted, demerit marks are given instead of a suspension, and also merit marks are given in the case of specially meritorious acts. Under this system men are encouraged to improve in their work, and often by special effort are enabled to reduce their demerit marks, thereby insuring their continuance in the service. At the same time those dependent upon them have not been deprived of the earnings upon which they must rely.

In maintaining discipline, it is impressed upon those in authority that the relation between the company and its trainmen is of a private nature, and that in directing or reprimanding an employe, no unusual publicity must be indulged in. Reprimands must never be publicly given, nor shall there be any show of undue familiarity between officers and employes when on duty.

The company's badge is regarded as a badge of honor, and none may degrade it and continue to wear it. Respect for authority and for one another is enjoined upon each and every one in the company's service, and wherever you turn our discipline will be manifest.

In its maintenance there are always obstacles to be overcome, but persistency, determination, and absolute fairness to all concerned will produce the desired result.

GENERAL SYSTEMS COMPANY.

An exhibit that is attracting a great deal of attention is that of the General Systems Company, of Dayton, Ohio, where the modern and practical methods of train dispatching, freight and express way billing, inspector reporting, requisition and purchasing are being demonstrated. The systems are claimed to be the most accurate and thorough the market affords. Verbal messages and unnecessary rewriting are entirely obviated; in other words, the maximum results are produced with the minimum effort. Economy, says Mr. M. C. Stern, general manager of the company, coupled with absolute security, the fundamental principles of the systems have won for the company the hearty endorsement of all users and cities of railway service. A call at this company's exhibit, located in Building 3, Section B, in charge of Messrs. W. L. Egry and James Joseph will be productive of information.

ELECTRIC RAILWAYS IN SPARSELY SETTLED COMMUNITIES.*

BY E. P. ROBERTS, THE ROBERTS & ABBOTT COMPANY, CLEVELAND, O.

What is a sparsely settled community? Does it mean that it has only a very small population, not only along the route but also at one or both terminals? Or does it mean that the country through which the road passes has a small population per mile of road, but that there may be considerable population at either or both terminals?

Moreover, from the income standpoint, the term is a relative one, as in some sections of the country the income per capita may be twice, or even more than that obtained in another section, perhaps because of greater reasons for travel, or because of less competition, or for the reason that such better earning road can readily obtain remunerative rates. Even when comparing roads in the same general locality, the greater income per capita may also be due to a greater demand for service. For example: the income per capita and per mile of road is frequently quite dissimilar for different roads running into the same terminal city, and also for roads operating in the same portion of a state, but serving entirely separate sections. Moreover, the cost of construction and the cost of operation and the rates which can be obtained must necessarily affect the decision as to the advisability of constructing a road, whatever may be the population.

In addition, the term "sparsely settled" undoubtedly refers to population only, whereas the writer firmly believes that there are situations where it is advisable to construct electric roads equipped for the handling of freight in trains, in addition to carrying passengers, package freight, and express matter.

Possibly the title was meant to refer to roads having a large principal terminal city and having a population of less than 800 or 1,000 per mile of road, exclusive of the population in such principal city, but a number of roads having less population have an excellent income per mile of road.

Possibly, however, it may be taken as referring to roads having such a light passenger travel as can practically always be handled by one medium-sized car operating on hourly headway for ten or twelve hours daily, and less frequently during the rest of the twenty-four and also less frequently for several months annually. The writer's opinion is that probably no electric railway which is almost entirely dependent upon passenger earnings is justified, unless at least hourly headway for the greater portion of the time is required to handle the business, and that even for such road it must be possible either to construct the road in a manner adequate for the purpose, at low cost, or higher rates must be charged than are usually obtainable, at least in most sections of the country.

Considering the subject assigned, as designated by its title, it would appear that only passenger traffic was to be considered, and, if such is the fact, the writer would suggest that if the country is sparsely settled, it is better not to construct an electric railway, but, as before stated, "sparsely settled" is a relative term and reasons for travel and rates obtainable are of vital importance, and passenger traffic is not the only source of income.

Later are presented a few records relative to interurban electric roads which show in a general way that the receipts per capita decrease as the density of population increases; but the individual variations from such general proposition are so great as to make it evident that a mere statement that the population is dense, or that the country is sparsely settled, does not determine the question as to whether or not to build an electric railway in any specific territory.

The following remarks will usually apply to any interurban electric railway.

What is the purpose to be accomplished in building a proposed interurban electric railway? Is it merely to obtain promoters profits or for a real estate deal? Or is the principal object to obtain a road which will be a good investment? The term "good investment," as here used, means something additional to what would be obtained from a well protected loan, such additional amount being on account of the risk assumed by the stockholder, and is the "speculative profit."

The writer refers to this additional profit because there is so much criticism on account of securities (bonds and stock) usually being in excess of the physical value; such excess is frequently referred to as watered stock. As a matter of fact, many of those who are most rabid in their criticism will not take the risk necessary "to get in on the ground floor," though probably anyone would be willing to purchase such securities on the original basis after success has been demonstrated, and would have no compunctions.

The foregoing remark is not meant to excuse many objectionable, even if legal, practices and I believe that in many cases promoters, syndicate managers and others, have robbed investors and wrecked properties, and that also in other respects their actions have been harmful to the individual and to the community. On the other hand, the investor who takes the risk is entitled to an indefinitely large return if he can properly earn it. Although, because of the failings of human nature, it would appear that there must be governmental regulations for interurban electric railways, as well as for other public service corporations, and that it is probably wise there should be a large amount of publicity relative to the finances, nevertheless, the fact that an investor, after taking a risk, makes 20 per cent. or more on an investment is not, in itself, a reasonable or just excuse for forcibly reducing his earnings.

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* Presented before the American Street & Interurban Railway Association, Columbus, O., October 18, 1906.

The writer has not overlooked the fact that publicity and many governmental regulations are for the purpose of protecting investors, and that the right of eminent domain is given in order to serve the public, and implies the receipt of an equivalent; but these, and other matters which could be referred to, do not affect the general principle set forth.

We will now give some consideration to the points which should be taken into account when investigating the advisability of constructing any proposed interurban electric railway and we will proceed on the basis that it is to be properly financed, designed, constructed and managed. Before presenting the points above referred to, I desire briefly to call attention to the various types of electric roads, as it is not unusual to hear even electric railroad men use the terms, "street railways," or "suburban railways," when referring to what are properly "interurban railroads."

There are two general classes of electric roads: Street Railways and Railroads. The street railway is, with improvements, the electrified horse car, and is operated along much the same lines; whereas, the electric railroad is to an increasing degree, the electrified steam road, and operation is, with necessary modifications, along the lines of steam railroading. To further differentiate, we may consider three classes: the city, or urban; the suburban, and the interurban. It is impossible to make a definite classification because many roads belong to more than one class, or are on the dividing line between two classes.

The city line proper is one lying entirely within the limits of a city, and, in general, its receipts depend upon the magnitude (population and area) of the city rather than upon the population per mile of road, as in the small cities the distance from residence centers to business centers is usually short, and the people can and do walk. On the other hand, in the large city, the distance between residence and business centers is usually great, and people ride more frequently than in the other case. As a result there may be a smaller population per mile of road in a large city, and yet such road may have far greater receipts per mile and per capita than in the smaller city, where the population per mile of track is greater.

Of course local conditions and peculiarities affect, to a large degree, the earnings, but generally speaking, electric railroads in larger cities show much larger earnings per mile and per capita than those in the smaller cities. One of the local conditions referred to is the distribution of the population; a city or town along a river, or valley, will frequently allow one line of track to serve practically all the population, the distance between residence, business and manufacturing sections being such as to assure riding.

Suburban roads are usually an extension of the city system and operate on highways, frequently with cars of the city type. The schedule provides for rather frequent stops, though less in number than for an interurban road. The car equipment is, or at least should be, provided on such basis. Suburban roads may be classified as those connecting a terminal city with one or more outlying towns and villages, and those which serve a suburban residence district. Generally speaking, the latter class will show greater earnings per capita for equal density of population, excluding the population of the terminal city from the population per mile of road.

Freight traffic on a city road is nearly always a negligible quantity, but in the case of a suburban or interurban road may reach a very respectable value. The electric roads doing the largest freight business are usually those which run through the most sparsely settled district. This is frequently due to the fact that the steam freight service in such district is usually very limited, or entirely absent. It is also a fact that such roads are generally constructed with the expectation of doing a considerable freight business, or, in some cases are forced to develop such business because of the small passenger traffic. As the light passenger traffic can be taken care of by cars operating under considerable headway, the track is available for freight service. In most cases such roads have single track, with sidings of such length and location as may be required.

The function of the three general types of roads referred to are somewhat indicated by the type of cars and motor equipment, which for each type is, or should be, provided.

A city car should have the seats so arranged as to be reasonably comfortable, but if any cross-seats are used, and as the rides are comparatively short, high backs and ample knee room are not essential, but it is necessary to have ample standing room and especially ample space near the doors, also a large rear platform and easy steps. Generally closed cars have longitudinal seats only, but if cross-seats are used they should not be near the entering doors, and some cars have a rail on the rear platform designed to prevent congestion at the entrance. The motors are comparatively small and are geared for low speeds.

The cars for suburban roads are generally somewhat larger and frequently have cross-seats and, because of the longer ride, are designed to give greater comfort to the passenger, but, as the city portion of the run is a considerable percentage of the total, and as in the suburbs there will be rather frequent stops, considerable attention must still be given to furnishing facilities for the quick loading and unloading of passengers.

Not infrequently suburban roads, or those which should properly be designed as suburban roads, are equipped with large and heavy cars geared for high maximum speeds and attempt to make fast schedules, while at the same time doing a suburban business and making very frequent stops. Such practice is almost always uneconomical, as it gives on the one hand, a poor suburban service, the cars being too large, the seating not best suited to the service, the headway infrequent; on the other hand, a wretched interurban service. A heavy car geared for high speed is very poorly adapted to suburban service with its frequent stops, and also results in an excessive amount of power for the service given.

Where the number of stops is large, it is folly to gear a car for high schedule speed. In fact with from six to eight stops per mile it is useless to gear a car for a higher speed than from 25 to 30 miles an hour, as no gain in schedule speed at all commensurate with the cost can thereby be obtained. Another difficulty arising from the use of large and fast cars for suburban service is the necessity for the high rates of acceleration which are required in order to make the time-card when the traffic is heavy and stops numerous. Such high rates of acceleration require large and expensive motors, and make very heavy demands upon the power-house, sub-station and line.

The most desirable passenger car for any interurban road depends upon the character of service. A road having a comparatively short run, and with frequent stops, should have a car and motor equipment very similar to that previously described for a suburban road, while on a road of considerable length, and especially for such cars as are used for limited service, the design should be based on giving comfortable seating, all, or practically all, seats being cross-seats, with high backs, long and wide seats, arm rests and ample knee room. In order to accomplish this the aisle room must be cut down and the seating capacity per foot of length decreased, and small platforms can be used.

The illumination should be carefully arranged and be liberal in amount, and a toilet-room and drinking water provided. In other words, the accommodations should be similar to those of a steam coach.

The motor equipment should be designed for the required schedule on the country run which, for nearly all recently designed roads, is on private right of way.

The equipments should always be geared for the very lowest speed that will make the required schedule, plus a sufficient margin for delays. Any higher gearing results in an unnecessary expense for car equipment, in some cases unnecessarily high repair bills, unnecessary expense for power, and also a larger power-house and sub-station equipment than would otherwise be required, consequently increasing the financial charges. The motor equipment selected should always be of ample capacity for the work which it has to do. New equipments may be heavily loaded for a long time before the effect of such overloading becomes evident, and smaller overloads are very slow to show their effect. But when the trouble once starts it comes all at once.

It sometimes happens that a road will increase its schedule speed, making the necessary changes in gearing to secure the required maximum speed, and apparently everything is lovely, but in one to two years there comes a sudden epidemic of burnt out armature and field coils, and within a very short period it is necessary to rewind practically every motor on the road. This is the inevitable result of long continued overload.

The foregoing remarks relative to the motor gearing and the capacity of motors are also applicable to motors for city and suburban cars, and are so evident as not to need any explanation, but there is one other point which is sometimes overlooked, and that is the effect on motor capacity of low voltage, especially on heavy grades. The capacity of a motor is practically limited by its heating. The heat generated in a motor (excluding iron losses) is proportional to the square of the current, and when the current varies is proportional to the mean square of the current. Therefore, the heating for variable current is greater than the square of the average current. In other words, if the motor is taking 50 amperes for 30 seconds and 150 amperes for another 30 seconds, the heating is greater than if it took 100 amperes for 60 seconds.

The speed is approximately proportional to the voltage, and the torque is approximately proportional to the current.

If, therefore, the voltage is lessened and the schedule maintained, the motors must be accelerated as rapidly as possible, full speed must be maintained as long as practicable and no coasting is permissible; the result is that the average current flowing during the period from start to stop will be greater than would have been the case if the voltage had been sufficiently high to permit of lower rates of acceleration and some coasting before braking begins. If there be a grade to climb, the current taken will be approximately the same at low voltage as at high voltage, it being presumed that in either case the motors are operated at the same controller point, but the time will be longer in the first instance, and consequently the heating during the climbing will be increased. If after the car reaches the summit it immediately runs on a down grade equal in degree and length to that just climbed, it might seem that there would be an opportunity to equalize, but such is not the case, for the reason that the mean square is not the same as the square of the average. Even if such were a fact it would not often apply, for the reason that, if time is lost on the up grade, the motors will be crowded so as to make the best possible time on the down grade; whereas, if there were ample time, the down grade might be coasted either entirely or to a large degree. In other words the effect of the low voltage and the grade is to "hit" the motors "coming and going."

The Value of Statistics and Their Proper and Improper Use.

Undoubtedly statistics are frequently of great value, but it is also a fact that they are often misapplied, and in such cases are worse than useless. The foregoing refers to statistics in general, but we will now consider same with special reference to interurban electric railways.

The special report of the United States Census Office relative to Street and Electric Railways, 1902, undoubtedly contains much information of value, but the data therein presented has frequently been misused. Average results for the United States or for individual states have been considered as applicable to a proposed road; whereas, in the writer's opinion, each proposition must be considered by itself, and only such statistics applied as are obtained from roads which are properly comparative, and as no two roads are identical, allowance must be made for the difference between the proposed road and such road or roads as are compared therewith. Even the fact that the proposed road has the same terminal city as the roads with which it is to be compared, and has the same population per mile of road, does not make the two propositions strictly comparative. For example: One proposed road may have to meet a different character of competition; or there may be greater or less reason for travel; or, the population may be differently distributed as to town, village and country population; or, it may be a different class of population, manufacturing or agricultural, all of which affects the probabilities of travel; or there may be a difference in the amount of express, package freight or carload freight which can be obtained; or there may be a material difference in the length of run in the city, or a material difference in first cost, thereby affecting the financial charge. For example: Some time since the writer had occasion to report relative to a proposed road entering a large city, and not only had the statistics of, but also intimate knowledge relative to, six of the eight roads entering such city. Three of the six roads were not considered as being at all comparative with the proposed road, the other three were considered as somewhat comparative. The income from one of the latter roads was $6.50 per capita, exclusive of the population of the principal terminal; for another road $6.53, and for the third road $7.00. Nevertheless, in making the report for the proposed road, none of these figures, nor the average, was taken, but a figure slightly lower than the lowest. This was done, not in order to be conservative, but as honestly expressing the writer's opinion.

The foregoing indicates the possible erroneous conclusion, even under a condition exceptionally favorable to the use of statistics, but if the average result of all roads in the general territory is used or if statistics obtained from one portion of the country are considered as applicable to another portion, then the conclusion reached is practically sure to be very different from the result which actually will be obtained.

As an extreme example of the misapplication or misunderstanding of statistics, the following may be of interest: Some time since, a report was brought to our office, which, from the civil engineering standpoint, was excellently prepared, although very weak and inaccurate as to the mechanical and electrical portion. It was, however, artistically bound, profusely illustrated with excellent photographs, and calculated to create quite an impression. When the writer turned to the page relative to "income," the amount was so large as to be surprising, particularly as he had been over the route. He asked the basis of the estimate and the following statement was made:

In the United States census report relative to Street Electric Railways, 1902, it had been noted that the average income per mile for Ohio Electric Railways was $3.43, and as they desired to be conservative, they used a figure, which, as I recollect, was approximately $2.50. I immediately informed the gentleman that he was in error, and handed him the census report, and he turned to a column headed "fare passengers per car-mile," and which had the figures 3.43 which he had taken to mean dollars and cents, whereas, of course, it meant persons, and then I suggested that he divide the anticipated income by from eight to ten, which naturally seriously affected the findings as to the estimated income.

Some Statistics Relative to Interurban Electric Railway and Discussion of Them.

The writer has always felt very strongly that each case must be considered by itself, but in view of several letters recently received, one from the editor of a technical paper and others from engineers, asking how we figure probable earnings of interurban railways, and whether it is not possible to obtain an empirical formula which would have some value, we prepared several tables and attempted to obtain a curve which might have some value. Curiously enough the first eight or ten roads tabulated gave such results as checked, with not an excessive variation, with the empirical formula suggested by one of our engineers; but even then there was such variation as would be sufficient to make the difference between profit and loss. This formula is based on allowing a certain annual income per capita from the population in the principal city, a greater amount in the towns, and a still greater amount in the country; but applying some additional data, we found that for many roads the suggested formula had no value at all. The formula is not given for the reason that it might be used even though it is misleading. Table No. 1 and Plate No. 1 show the application of the formula. The first portion of the table give those to which the formula is applicable and which encouraged us, even though the writer could not see that there was any reason to anticipate that any formula would prove even approximately applicable, but the rest of it shows the fallacy of anticipating that any formula can be found which will be of service. One set of table and curve, however, is presented, which seems to us to have some value, taken merely as an indication and never applying to any individual case the results indicated by the curve.

Table No. 1.

Road number.	Total population.	Earnings estimated by use of formula.	Actually earned.	
1	518,550	$478,252	$475,361	Close.
2	693,598	623,478	659,873	Fair.
3	445,259	229,524	225,760	Close.
4	185,425	227,377	219,188	Close.
5	47,840	88,500	85,055	Close.
6	67,811	200,300	198,500	Close
7	104,807	204,500	195,000	Close.
8	141,214	144,000	234,278	Very had.
9	64,933	117,000	131,000	Fair.
10	66,398	107,000	148,700	Bad.
11	165,903	141,000	171,671	Rather bad.
12	394,728	333,000	406,000	Bad.
13	207,000	144,000	106,782	Bad.
14	207,077	108,500	95,000	Rather had.
15	244,255	267,500	122,000	Very bad.
16	28,392	74,000	84,822	Close.

The population here includes the entire population on and tributary to the line, including terminal cities regardless of their size.

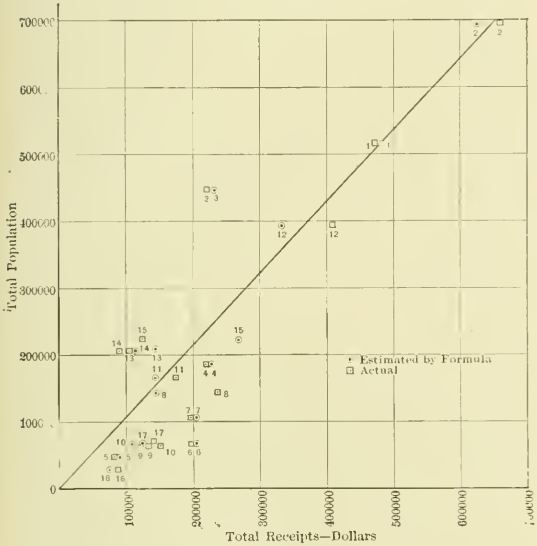
The population stated by the tables and curves as being along the route is not based on that within a certain distance of the road, but is based on local conditions. To ascertain this necessitates more time and skill than when the former method is followed, but it is the one which I consider proper, and consequently it is followed by our office.

We always consider the entire population directly on the route, and when one city greatly preponderates, exclude such principal city, but noting the population of such city, and when there is no such greatly prepondering city we consider all the population. For sections a greater or less distance from the route we use a percentage based on local conditions, and take into account the character of the population, the reasons for travel, the comparative facilities, including accessibility, etc. For example: Near the principal city a person residing three miles or less from the corporation limits of the city, and three miles from the proposed road, would seldom, if ever use it, whereas, if he were a considerable distance from the city, and three miles from the road, he would use it almost as much as if he lived directly on the route, provided that there was not another electric or steam road nearer to him. If such road were a steam road consideration would be given to the service provided by it.

It is also evident that if the location of the proposed road is along a river, especially one of considerable width, and having a few bridges, the population on the other side of the river from the road has lessened in value; it might not, geographically speaking, be a quarter of a mile distant, but from the standpoint of accessibility may actually be several miles away. In some cases and because of connection with steam or electric railways, or river transportation, or existing stage routes, considerable value should be given to a population at a considerable distance from the route, whereas in other cases, and as indicated, the population quite near the route may have little value.

The population so obtained is what we term the "equivalent" population by which is meant the population, which, if all of it were directly on the route, would equal in amount of travel the actual population as it is actually located. For example: a population of 1,000 may be considered as equivalent to 100 or 200 or more directly on the route.

Relative to the population, our custom is to take the 1890 and 1900 census and note the rate of growth, and also to give due consideration to the school and voting population, etc., and checking any statements as to unusual growth, or growth at a more rapid rate than between 1890 and 1900. For example, the census records for Oklahoma have little value, and there are portions of the country where the voting record is not of great value, and where the income from the population not so recorded is very considerable. The ratio of the total population to the school or voting census is quite different in different sections, and in the country and in towns, and in order to obtain the proper multiplier we compare the last United States census with the school census at such time.

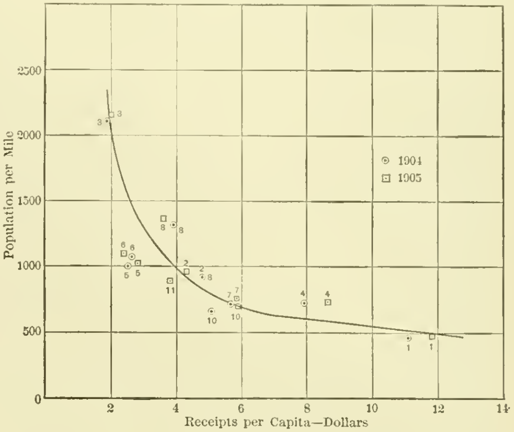


Curve No. 1.

Relative to the population which should be considered, we give separate value to the principal terminal city when it is much larger than any other city along the route. The writer's present opinion is that usually it makes little difference to the interurban road whether the principal city had 100,000 or 500,000 population, provided that it is the principal city in that general section of the country, and therefore the one to which all business tends.

If the interurban road has a pleasure resort, it might seem fair to presume that it would receive more passenger traffic from a terminal city of 500,000 than it would if such terminal city were materially smaller. On the other hand, the larger city will have more places of amusement, and it is a question whether such seeming probable result will prove to be a fact. The freight and express business from the principal city depends upon the conditions along the route, and the same is true of travel for business reasons, and also largely for social reasons, and is not affected by the size of the principal terminus. The travel into the principal terminus is not affected by its population, provided, as before stated, it is the principal city in the general section of the country.

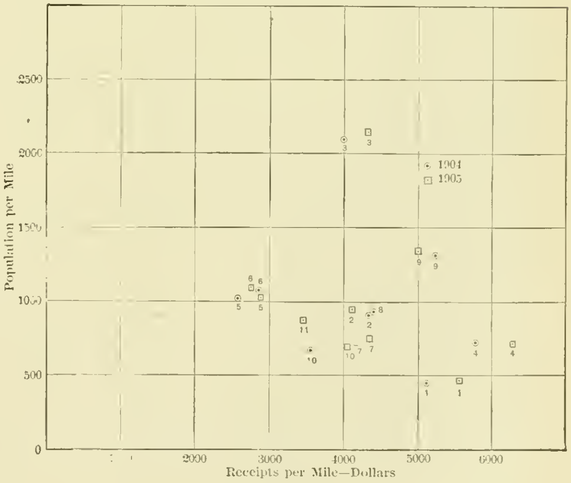
The receipts per capita depend upon the reasons for travel, comparative facilities, habits of the people, character of the population, comparative costs of travel, etc., and to apply any statistics requires not only a careful study of the conditions relative to the proposed road, but also a full knowledge of the conditions relative to the roads from which the statistics are taken, and a careful differentiation from application of such statistics.



Curve No. 2.

Table 2 and Curve 2, corresponding therto, show in a general way and for the roads considered, the relation between receipts per capita and population per mile of road, exclusive of the population of the principal terminal city. The effect of the population of the principal terminal city is above referred to.

The general characteristics of the various roads are as follows: Curve No. 2 has the population per mile plotted as ordinates, and the receipts per capita (in dollars) as abscissae. The various points marked on the sheet are numbered to correspond with the following statements as to the characteristics of the various roads. The roads considered are all in one general section of the country, otherwise the difference would have been still greater.



Curve No. 3.

The index numbers following do not correspond with those used for table and plate No. 1.

sources—passenger, express, carload freight, mail, advertising, and, in some cases, the sale of electric energy for light and power. The last three sources will be disregarded, and consideration merely given to the income from passengers, express and freight.

Passenger Income.

Having obtained the equivalent population in the manner previously described, the next and most important step is to determine the probable income per capita. Consideration must be given to the reasons for travel, comparative existing facilities, including railway time tables and rates, and possibilities or probablities of existing or of other proposed roads furnishing increased facilities. The habits of the people must be studied, the existing trend of traffic and every factor which may influence the situation. Some of these factors can be given an approximately definite value, and others are largely a matter of experience. To each must be applied personal judgment and the actual or unconscious application of statistics obtained from other roads having condition more or less analogous to those of the projected road, and upon the ability to ascertain the conditions and properly apply the results elsewhere obtained depends the accuracy of the predetermination.

This refers more especially to passenger travel, but practically the same method is followed in connection with freight, both package and box freight, including milk, garden truck, etc., also mail, although the latter is not generally of great financial value, but policy may make it desirable.

Express matter and so-called package freight can usually be carried either in a special compartment of a regular car or in a special express car similar in general make-up to the passenger car used on the road, and, in either case, can be handled without interfering with the regular schedule and without any extraordinary demands for power. Bulk freight, on the other hand, to be profitable must be handled in fairly large qualities, and this requires the operation of train units of several cars. If such trains are run in the day time when the regular passenger traffic is on the road, it necessarily interferes more or less with the regularity of the passenger schedule, as such trains move at slower speeds than the passenger trains. In addition, such trains demand a large amount of power, consequently require a considerable addition to the power-house, and also make it necessary to install sub-stations of such capacity as are required for one or more freight trains in addition to the regular load due to passenger cars. If there are a sufficient number of freight trains on the road to keep the additional machinery in the sub-stations reasonably well loaded this is not objectionable, but, on the other hand, if but one or two trains are on the road at a time it necessitates the installation of large capacity sub-stations, and consequently light average load and power efficiency.

In some cases it is possible to haul the freight during the night when the passenger service is either partially or entirely discontinued, and in such cases it may be possible to avoid the installation of additional sub-station machinery for freight service only. Even in this case, however, the freight haulage may involve the operation of several sub-stations to handle one or two trains, with a resulting very low load factor and very poor efficiency in the sub-station.

Another difficulty which arises in the hauling of heavy freight trains on the average interurban road, is that of delivering sufficient power to the train by means of the ordinary trolley wire. This difficulty does not apply in the case of the third-rail roads or in the case single phase alternating current is used.

Terminal facilities, railway connections and agreements, etc., are of great importance.

Where bulk freight is to be handled in considerable quantities on an electric road, it is just as necessary to keep down to a low grade as in case of the steam road. The co-efficient of tractive resistence in the case of a 10-car freight train at 15 miles per hour, and on level track is only some 7 or 8 pounds per ton, where, on the other hand, each one per cent of grade adds 20 pounds per ton; that is, on a one per cent grade the tractive resistance is perhaps 27 pounds per ton, or nearly four times as great as that on a level track. Freight service, therefore, demands low grades so as to keep down the cost of locomotives, of power-house, sub-stations, and line equipment.

Having predeterminated the obtainable traffic, the next step is to decide as to traffic facilities which must be furnished for the anticipated business. Undoubtedly a map has been available from the start, and the general location of the proposed road has been marked thereon, from which distances between the principal points have been ascertained. The specialist also has gone over the route and is fairly well informed as to the physical conditions, and in a general way, the most desirable locations, both in the country and in the cities and towns, also the practicability of obtaining such locations. In fact, he is quite well informed, not only as to the general situation, but also as to the business situation, probable character of franchises obtainable, legal conditions, etc. If the country is reasonably level he is able to approximate the cost of the grade, has ascertained the probable length of bridges required, and from the maps obtained distances with sufficient accuracy for a preliminary study. If the country is rather rough a topographical survey is exceedingly helpful, and quite frequently can be obtained from the United States Geological Survey. In some cases it is desirable to make at least a preliminary survey before the proposition has proceeded very far, but in many cases this is not only unnecessary but actully inadvisable, as it necessarily indicates the most probable route and frequently increases the cost of right of way. A time must arrive when the location becomes evident, but there are methods of precedure which minimize the tendency to increase the cost of the right of way which practically always follows such publicity. In most cases the country population desires the road, but each owner of land desires to designate the exact location, which may be to avoid moving the farmers' house or barn, or passing between such buildings, which of couse is natural, or may be to place it on the property immediately across from his home and belonging to his neighbor. As soon as he feels sure that the road will be accessible to him, he "stiffens up," whereas frequently he would rather give the right of way than not to have the road. This is human nature, and he is no different from the rest of us. The statement is merely given as an example of the points which experience proves must be taken into consideration at every step in connection with a proposed road.

Having, as before stated, a preliminary map and possibly a profile of the route, train schedules and train sheets are prepared in order to ascertain the approximate time of the runs of the various classes of trains (each of which may consist of one or more cars), and which are of importance in determining the number of cars required, the motor equipment for each car, the amount of power required, the location of sub-stations, and other matters. Of course, at this time such schedules and train sheets are of a preliminary character, and are liable to modification after a final map and profile have been obtained, and also numerous other matters have been definitely decided, but a competent man will prepare the preliminary schedule with a very close approximation of the final ones.

Some of the questions which will arise at this point are as follows:

With a preliminary map which shows the length of the road, and the length of the run in cities, towns and country, including the length in the pricipal terminal cities, and knowing that it is desirable that passenger cars should be operated at regular intervals, starting from terminal points, preferably on the hour, half hour or quarter hours; also knowing that the cost of train crews is one of the principal expenses, and consequently that the layovers at the ends of the route should not be greater than necessary for unloading and loading the cars, with sufficient allowance for delays in reaching such terminal points, and not forgetting that increased speed necessitates, for any given size and weight of car, greater capacity of motors, and also increased cost of the power equipment, including motors, sub-station and powerhouse machinery; also knowing that the runs in the cities and towns are under city regulation as to speed, and therefore, cannot be increased by higher speed motors; also realizing that increased stops in the country materially decrease schedule speed, the proposition is to so combine all these factors as to obtain the best net result.

In such study, consideration must also be given to grades, grade crossings and other railways, and, to some extent to highways, also in some cases the service given by competing roads, either steam or electric. As an example: Suppose that the preliminary schedule results in two hours being required for the run. Evidently it is desirable that by some means the time should be reduced to one hour and forty minutes. Such reduction may be obtained by reducing the length of the runs in the towns, or by lessening the number of country stops, both of which seriously affect the schedule speed, or possibly by reducing the length of the route which may require increased cost out of proportion to the benefit, or by reducing the grades, which also may cost more than in proportion to the benefit. It is a fact that the income per capita in the country will generally be greater than from that in towns but an effort to obtain every dollar possible from the country may be exceedingly poor economy. It might be considered that this is a matter of policy to be determined by the management, but it is of vital importance in connection with the design, if the design is to be such as will give the best returns per dollar invested.

The consideration of the route may start with the principal terminal city and it is of great importance to have the

Road No. 1 is a double track interurban in the Central West, having its terminal in a large city, but having no other towns of any considerable size. It has a rather large suburban resident population, especially during the summer, and the double-track main line of the road is paralleled by a third track operated by the same company, and two or three miles from the main line, but connecting with it at both ends. The earnings include both lines. The population of the principal city is excluded. Its data are:

	1904.	1905.
Population, total	20,402	20,692
Population, per mile	463	470
Earnings, total	225,751	245,809
Earnings per mile	5,130	5,560
Earnings, per capita	11.06	11.84

Road No. 2 is a 42-mile road in the Central West, having a medium-sized terminal city, the population of which is excluded from the total.

	1904.	1905.
Population, total	38,469	40,005
Population, per mile	915	952
Earnings, total	181,201	173,153
Earnings, per mile	4,314	4,123
Earnings, per capita	4.71	4.33

Road No. 3 is a 34.14-mile, having several small cities, whose population is included in the totals.

	1904.	1905.
Population, total	71,338	73,249
Population, per mile	2,100	2,150
Earnings, total	136,918	147,851
Earnings, per mile	4,000	4,330
Earnings, per capita	1.90	2,20

Road No. 4 is a 39-mile road raving a large terminal city and one smaller terminal city. The larger city is excluded and the smaller city is included in the total population.

	1904.	1905.
Population, total	28,424	28,781
Population, per mile	730	740
Earnings, total	225,410	248,912
Earnings, per mile	57,880	6,300
Earnings, per capita	7.90	8.60

Road No. 5 is an 80-mile road in the Central West, having only one city of any considerable size, and the population of this is included in the totals.

	1904.	1905.
Population, total	80,362	81,851
Population, per mile	1,004	1,024
Earnings, total	205,806	230,758
Earnings, per mile	2,572	2,885
Earnings, per capita	2.56	2.82

Road No. 6 is also a road in the Central West, 30 miles in length, and having one medium-sized city, population of which is excluded from the totals.

	1904.	1905.
Population, total	32,373	32,993
Population, per mile	1,079	1,100
Earnings, total	85,055	80,100
Earnings, per mile	2,835	2,770
Earnings, per capita	2.66	2.43

Road No. 7 is a road in the Central West, having one large and one very large terminal city, both of these are excluded from the totals; miles of track, 160.

	1904.	1905.
Population, total	116,992	118,957
Population, per mile	731	743
Earnings, total	660,000	699,339
Earnings, per mile	4,125	4,370
Earnings, per capita	5.64	5.87

Road No. 8 is also in the Central West, having 92 miles of track and one large terminal city, the population of which is excluded from the totals.

	One half 1904 and One half 1905.
Population, total	85,082
Population, per mile	924
Earnings, total	404,880
Earnings, per mile	4,400
Earnings, per capita	4.75

These figures are for the last half of 1904 and the first half of 1905.

Road No. 9 has one large, one medium, and one small terminal city. The large terminal city is excluded and the other is included in the total. Miles of tracks, 45.

	1904.	1905.
Population, total	59,166	62,124
Population, per mile	1,315	1,353
Earnings, total	234,278	223,605
Earnings, per mile	5,205	5,000
Earnings, per capita	3.95	3.60

Road No. 10 is a large road in the Central West, having 134 miles of track, and one very large terminal city, the population of which is excluded.

	1904.	1905.
Population, total	92,359	94,200
Population, per mile	692	702
Earnings, total	475,361	543,226
Earnings, per mile	3,547	4,054
Earnings, per capita	5.13	5.78

Road No. 11 is a 58.6-mile road in the Central West, having three small cities, all of which are included in the totals.

	1905.
Population, total	52,052
Population, per mile	887
Earnings, total	197,934
Earnings, per mile	3,475
Earnings, per capita	3.80

Curve No. 3: This has, as ordinantes, the population per mile of road and as abscissae the receipts per mile of road, and it will be noted that the effect is that of a shot gun target, the points scattering very widely and showing no inclination to any definite law.

Evidently this plate has no value, except to show the fallacy of using averages as applicable to any given case.

Examples of this character could be multiplied indefinitely but we will now merely refer to two tables in the Street and Electric Railway Census Report for 1902. These tables are found on page 19 of the report.

The first table (No. 13) shows for one city of 28,000 people 144 trips annually per inhabitant, and for another city having 60,000 population only 60 trips; whereas the general rule is that the larger the population the greater the rides per capita. The same table shows that for two towns, each having 36,000 population, one had 66 rides per capita and the other 136.

Table No. 15, on the same page, shows that the average miles of track per 1,000 population increases as the total population decreases, and that the rides per capita vary in the reverse direction.

Examination Relative to an Operating or Proposed Electric Railroad.

Such an examination necessitates the application of personal judgment, and, to a greater or less degree, the application of statistics—and, before giving detailed consideration to such examination, it may be well to state the object of such examinations.

The examination of an operating plant is generally in order to ascertain its existing income, gross and net, the past rate of increase, and the probability as to the future, its physical value, and whether it is economically advisable to make additions and improvements. An examination is also made of the franchises, and of other matters outside of the construction and operating features.

The examination of the income and expenses is, as nearly as possible, in accordance with the Standard Classification of Accounts prepared by the American Street and Interurban Railway Accountants' Association, and statistics obtained from other roads are compared therewith in order to note any considerable variations from what may be considered as normal, and the reason for any such variation is investigated. Sometimes actual statistics obtained from other roads are not referred to, because the investigator has such knowledge as enables him to apply results he has elsewhere obtained to the case under consideration, and he may do so unconsciously. But whether consciously or unconsciously he uses statistics is immaterial, the principal point being that he does use and compare them with local conditions and applies personal judgment.

If the examination is relative to a proposed road it must include a predetermination of all the factors entering into total cost, both first cost and operating, also income, both gross and net, and evidently requires not only a wide experience, but also excellent judgment in the application of statistics.

The object of an investigation as to the advisability of constructing a proposed interurban electric road is evidently to ascertain the probable resulting net earnings per dollar invested. In order to arrive at such conclusion it is necessary to ascertain the probable gross income, the total first cost and the consequent resulting financial charge and the operating expense. Logically these matters should be taken up in the order stated, but in many respects they are inter-dependent, and are considered simultaneously.

A competent specialist by going over the proposed route, can determine with a fair degree of approximation, the general character and cost of a road suitable for the general conditions, and obtain a birdseye view of the situation, from which he can prepare a general plan to use as a starting point for estimating cost and income. As such simultaneous consideration is impracticable to present in a paper, we will endeavor to consider the matter in a logical manner.

First: The probable income. This may be from several terminal station in such city well located relative to the retail district, which is generally also the amusement center.

Generally, interurban roads entering a city of any considerable size use the tracks of the local street car system, but sometimes it is possible to obtain an independent entrance, and, when the financial conditions warrant it, this is preferable. It is, however, seldom warranted unless the anticipated travel is very considerable, and, of course, is materially affected by the cost of construction required in the city, including the cost per mile and total mileage, which includes the first cost and the maintenance of street paving, sprinkling charges, if any, etc., and city taxes. It also depends upon what arrangement can be made with the local company for operation over its tracks.

In a general way, the shorter the route in the city or more correctly, the less the time of the run in the city, the better for the interurban railway.

The foregoing materially depends upon the frequency of service given by any competing steam road and by the time required between the station of the steam road and the retail center, not only in the principal terminal city, but also in the principal towns along the route. For example, in a case now in our office, a large amount is being expended in order to reduce the time required in the principal city and because the competitive steam railway service is very frequent, there being two competitive steam roads, each operating trains hourly. In another case where the competition is four or five trains each way daily and most of such trains are through trains, generally one or two hours late and only stopping at two points along the route other than the principal city, it is not advisable to make large expenditures in order to save a small amount of time.

Another point, somewhat allied to the foregoing, is the location of the road in cities and towns along the route. The receipts of an interurban electric railway depend largely upon the accessibility of its cars and its frequent service, but, on the other hand, accessibility in the cities and towns generally means somewhat increased first cost, also a longer time for the run. If freight cars are to be handled it means considerable additional trackage for the freight line.

In addition to the foregoing, the recent development of the alternating current motor system makes it desirable for such roads as use this system to keep on private right of way to as great an extent as possible ,and when in cities and towns to use only such streets as will allow the use of high voltage trolley. As a matter of fact, the high voltage trolley is now used in some towns of considerable size and on roads passing through the heart of them, but it is hardly probable that this will be permitted in all towns. In some locations it may not be found advisable, even if permitted.

Having made a preliminary location and ascertained the distance in the cities, towns and country; having considered that a certain-sized passenger car operating on a certain headway will give the best service and on the presumption that all things considered a certain grade will be most economical, a train schedule is prepared showing the time of the run for passenger service. There will generally be two train schedules, one for express and the other for local service.

It is advisable that the trains should follow at regular intervals, which intervals, however, may be varied at different times of the day and at different seasons, but the trains should always start from one end on the hour, and when more frequent service is desired, half hourly and quarter-hourly. The time of leaving the other end should also be on the hour or at some regular division, such as the half or quarter-hour. It is evidently necessary, therefore, to provide motors which will make such speed as is required to give a schedule enabling a car to make the run one way and provide at the end of such run sufficient time for layover, so that it can unload and load with sufficient leeway, and, in case of delays, it will still start out on the return run on the schedule time. The time of the run in the principal city is dependent upon the schedule time of the city cars if the local company's track be used, or upon local ordinances and conditions if the interurban company has its own track. The schedule speed in the principal terminal city will probably be approximately eight to twelve miles per hour, being somewhat less in the congested portion of the city run, and possibly slightly greater in the suburbs.

The same conditions apply to the runs in the towns along the route, although generally to a less degree, but in any case the schedule in cities and towns is based on local conditions and not upon the speed obtainable by the motors.

The speed on the country run which, for modern roads is generally on private right of way, depends upon the grade, and, for any given weight of cars, upon the power of the motors, and, of course, upon the maintenance of the voltage. The schedule speed depends upon these factors and also upon the number of stops.

The length of layover is often of material bearing on the question of size of motors. Sometimes by allowing a car to lay over at one or both ends of the run for 15 or 30 minutes it is possible to use smaller motors than would otherwise be necessary. Such layover is seldom objectionable, as it gives an opportunity to sweep out and clean up a car and frequently when the car barn is at one end of the terminal, it is possible to provide such a layover without any additional expense. By so doing a material saving can be made on the first cost of all the car equipments and may more than offset the first cost of the extra cars and equipments which may be required, and the repair and depreciation may be less. Actually it is seldom that additional cars would have to be purchased as there are always supposed to be enough cars for special occasions.

The number of stops made by a car has a very decided effect upon the size of motor necessary to drive it and with any given schedule and car the less the number of stops the smaller and cheaper the motor equipment.

Taking a given car geared to a maximum speed of 40 miles per hour, with eight stops per mile, the possible schedule speed is less than 10 miles per hour. With four stops per mile the possible schedule is less than 15 miles per hour. With two stops per mile the schedule speed is about 20 miles per hour and with one stop per mile the schedule speed is about 26 miles per hour. On the other hand, with one stop in eight miles, a schedule speed of 34 miles per hour can be made. Of course the above is based on having a level and straight road.

Had the same car been equipped with motors geared to but 30 miles per hour, it would have been made with eight stops per mile, a schedule speed of 8 miles per hour, which is practically the same as before; with four stops per mile it would have made a schedule of 13 miles per hour; with two stops per mile, a schedule of 17 miles per hour. The schedule will not only be practically as good as that made with higher gearing, but also the motor equipment can be decidedly smaller and cheaper, and the fluctuation of load at the power house will be much smaller than that resulting from the higher speed car.

Some roads have larger cars than are most economical for the service and the use of smaller cars is of additional value by reducing the size of motor equipment required, and by lessening the fluctuation of load at the power house. Smaller cars also permit of lighter track construction, small sub-stations, and, in fact, lower costs generally. On the other hand, if travel is great enough so that a small car cannot handle the traffic, then two cars can be run on half of the headway with but little more cost, except as to train crews, than for the operation of one large car, with the result of much better service, with consequently increased income and with comparatively small increase in the power-house and sub-station equipment required.

If, for example, a preliminary estimate shows that it will take two hours to make the run over the proposed road, 40 miles in length outside of the principal city, and possibly three miles therein, it is evident that a time table, based on cars leaving such end of the route on the hour, will necessitate the car leaving at the same time as it arrives; in other words, there is no provision for layover. It is evidently necessary to lessen the time of the run, and this must be done by lessening the time of the run in the cities and towns which presumably can only be done by lessening the length of the run in them, especially the run in the congested district, or by increasing the speed of the cars, requiring, therefore, more powerful motors or by reducing the number of country stops (this necessitates a consideration of the effect on travel) or by reducing the grade, and unless the grades are considerable, tthe amount of the reduction, as far as time is concerned, will generally be found quite small and not comparable with lessening the number of stops. For example: In one case we prepared a preliminary estimate of the cost of the grading required to obtain a maximum 1, 1½ and 2 per cent grade through a country rolling the entire distance, and the time which would have been saved by reducing from 2 per cent to 1 per cent was not greater than a reasonable allowance for time lost in the principal city on account of delays in the congested district; whereas, the additional cost required for the reduction of grade would be very considerable.

When considering freight service the principal consideration is the train load, schedule speed within considerable limits not being of great importance, but the load which the electric locomotive can haul, requiring the service of only one train crew, is of vital importance. In connection with passenger service it is of great importance to make such schedule as will use the time of the train crews to the greatest advantage, as the cost of their time is one of the principal items of operating expense.

Having obtained a general view of the proposition, especially as to its general character and the approximate amount of traffic and having, from a map, obtained distances, and from examination of a preliminary or a final profile, ascertained approximate grades and the amount of grading construction, the investigator is is in a position to decide as to the general type of road, the system to be used (laternating or direct current motors) and to prepare a preliminary estimate of first cost, cost of operation, and, most important of all, net income.

TABLE NO. 1

VOLTAGE DROP IN CONDUCTORS $= \frac{11 \times A \times L}{C\ M}$

MILES.	TWO IN MULTIPLE—TROLLEYS. (5350)														SINGLE. (5400 Per M)						
	No. 00 Trolley.							No. 000 Trolley.							300 M. Feeder.						
	Amperes							Amperes.							Amperes.						
	50	100	150	200	250	300	450	50	100	150	200	250	300	450	50	100	150	200	250	300	450
½	5.5	11	16.5	22	27.5	33	50	5	9	13	18	22	27	39	5	10	15	20	25	30	45
1	11	22	33	44	55	66	99	9	18	26	35	44	53	79	10	20	30	40	50	60	90
2	22	44	66	88	110	152	198	18	35	53	70	88	105	158	20	40	60	80	100	120	180
3	33	66	99	132	165	198	297	27	53	78	105	132	158	236	30	60	90	120	150	180	270
4	44	88	132	176	220	264	396	35	70	105	140	175	210	315	40	80	120	160	200	240	360
5	55	110	165	220	275	330	495	44	88	131	175	219	263	394	50	100	150	200	250	300	450
6	66	132	198	264	330	396	594	53	105	158	210	263	315	473	60	120	180	240	300	360	540
7	77	155	231	309	385	462	694	62	123	184	245	307	368	552	70	140	210	280	350	420	640
8	88	177	264	354	441	528	795	70	140	210	280	350	420	630	80	160	240	320	400	480	720
9	99	198	297	397	394	594	893	79	158	236	315	394	473	709	90	180	270	360	450	540	810
10	110	221	331	442	552	663	993	88	175	263	351	438	526	788	100	200	300	400	500	600	900
11	121	242	363	.		..	....	97	194	...	..	....	...	....	110	2.0	330	440	550	660	990
12	132	264	....	....	....	....	....	106	....	...	. .	....	....	....	120	240	360	480	600	720	.....
13	143	286	....	...	...	....	....	116	...	....	. .	. ..	..	....	130	660	390	520	650	780	.....

The preliminary report informs the projector as to whether or not the plan has such merit as to warrant its construction, and if it is not warranted, then the sooner such fact is ascertained the less time and money which will be wasted. If, however, it is warranted, then successful operation depends, to a large degree, upon the design being that best suited to the condition, such amount of money being available as required in order to obtain the best net results, and its construction to be so supervised as to assure that the contracts are lived up to.

Some interurban electric railroads should never have been constructed, as under no conditions were they warranted. Others have been improperly designed, considered from the standpoint of obtaining the best net results. In some cases the construction has been of too expensive a character, and in other cases there has not been sufficient money expended in the construction. Other roads have not been properly maintained, and still other roads have not been properly managed. Of course some roads come under more than one of these classes. If, however, a road is justified, then its success, exclusive of its financing, depends upon obtaining the best location, proper design for the condition, proper construction, competent operation. It is noted that the first three are dependent upon the expert adviser and that the result which can be obtained by the fourth is largely affected by the attention given to the first three. Moreover, the first three are practically unchangeable after the road is constructed, whereas, the fourth, if in incompetent hands, can be changed.

TABLE NO. 2

C. M. OF COPPER CONDUCTORS

Based on 20,000 Volts, 3 Phase, 90% Power Factor, 10% Loss in Transmission. 1 Mile Feeder=5,400 Feet.

$$C.\ M. = \frac{D \times W}{P \times E^2} \times K = \frac{(5400 \times 100) \times (2{,}000{,}000)}{(10) \times (20{,}000)^2} \times 1330 = 359{,}100.$$

K. W.	Distance of Transmission in Miles.									
	10	20	30	40	50	60	70	80	90	100
100....	1,796	3,591	5,387	7,182	8,978	10,773	12,568	14,364	16,160	17,955
200....	3,591	7,182	10,773	14,364	17 955	21,546	25,137	28,728	32,319	35,910
300....	5,387	10 773	16,160	21,546	26,932	32,319	37,705	43,092	48,478	53,865
400....	7,182	14,364	21,546	28,728	35,910	43,092	50,274	57,456	64,138	71,820
500....	8,978	17,955	26,933	35,910	44,888	53,865	60,843	71,820	80,748	89,775
600....	10,773	21,546	32,319	43,092	53,865	64,638	75,411	86,184	96,957	107,730
800....	14,364	28,728	43,092	57,456	71,820	86,184	100,548	114,912	129,276	143,640
1000....	17,955	35,910	53,866	71,820	89,775	107,730	125,685	143,640	161,595	179,550
1200....	21,546	43,092	64,638	86,180	107,730	129,276	150,822	172,368	193 914	215,460
1500....	26,932	53,865	80,798	107,730	134,662	161,595	188,528	215,460	242,302	269,325
2000 ..	35,910	71,820	107,730	143,640	179,550	215,460	215,370	287,280	323,190	359,100

10-1901.

If the project is warranted, then the maximum degree of success in financing depends largely upon the proper presentation of the matter. There should be a short, clear and concise statement as to the territory served, the estimated first cost and the gross and the net income, followed by such detailed estimates, statements and other information as experience indicates is desired by financial houses.

When it is decided to construct the road, a location survey is made, which may or may not have been preceded by a preliminary survey. The latter may have been and frequently is made prior to the preparation of the report submitted as the basis of the financing. In fact, sometimes a location survey is made prior to such time.

The object of a preliminary survey is to ascertain distances more accurately than are generally obtained from published maps, and also to more closely approximate the grades and amount of grading than can be ascertained merely by going over the route, although, as before stated, if the country is reasonably level, an expert in such work can quite closely approximate the amount of grading. Preliminary surveys of alternative routes are frequently made and are useful for comparison of length of routes, cost of construction, comparative value of route from earning basis and are sometimes of assistance in obtaining rights of way at minimum cost.

In connection with the foregoing, it might be noted that promoters sometimes make statements and promises and also obtain rights of ways and franchises which unnecessarily add to the cost of construction or of operation or both. As, for example, agreeing that the power-house or car-house or both shall be located within or adjacent to a certain town. Placing them within the corporate limits may add to the taxes and in other respects it may be undesirable, as, for example, one franchise which came to our office required a power-house to be in a certain city and the water would have to be obtained either from the city or pumped from deep wells. In another case local service in one small city was required with such frequency of service as could not possibly be remunerative. In other cases the rights of way in the country have been obtained with special reference to the cost of such right of way or to favor some land owner and without taking into consideration the fact that the saving of one mile of single track road and the line work for it will generally save $12,000 to $15,000 in first cost, save maintenance and depreciation of omitted track and pole line, lessen the time of the run and the power required, and altogether be of such benefit as to be worth $20,000 or more, which amount would generally buy a considerable amount of private right of way in the country.

As the civil and mechanical electrical enginering departments are closely related, it is necessary to decide as to what grades will be most economical. Reducing the grades adds to first cost and also adds to the maximum power required and consequently, unless storage batteries are used, reducing the ratio of average power to maximum power and such reduction increases the cost of fuel. The effect of grades on passenger schedule must he noted and also on the load which freight locomotives can haul. In a general way, it is evident that the more frequent the service and the heavier the trains, the greater the amount which it can be most economically expended in the reduction of grades, and as a future improvement of grade will require a greater expenditure than if such grade were established at the start, it is wise to give consideration to the somewhat distant future.

Having decided as to the grades, the train schedule and the motor equipments, the next point is to provide for the furnishing of power to the cars. Presumably decision has been reached as to the system to be used; also as to the most desirable location of the power-house and sub-stations. The next point is to definitely determine the general character of the machinery and the rated capacity and number of the various units.

Each sub-station must have sufficient capacity for maximum demand and judgment must be exercised as to whether to provide any reserve capacity in excess of such maximum. The number of units must be such as will furnish power for the average load, even though one unit be crippled and also will enable the units in operation at any one time to operate as nearly as possible at their rated capacity. It is also desirable not to have an excessive number of units, as for a definite total capacity this increases the first cost.

The general proposition as to the design of the power-house is the same as stated for sub-stations, but on the basis that such power-honse is to be a steam plant, careful study must be made of the cost and character of fuel, the required draft for such fuel, the best ratio of grate to heating surface; and if compound engines are used, the best ratio of cylinder diameters, in order to obtain the maximum economy under operating conditions, taking into account steam pressure, superheat, if any, and the most economical vacuum.

It will be noted that the preceding necessitates a predetermination of the load curve, the probable momentary and short period fluctuations, and, as before stated, these are affected by the grades, the weight, maximum speed and schedule speed of the cars and by the train schedules, all of which indicates the close inter-relation of the various factors entering into the problem of so designing an interurban electric railway as to obtain the maximum rate of dividends.

After all plans and specifications are prepared the contracts are awarded and it is unnecessary to state that there is considerable opportunity for saving money in awarding contracts.

The next step is to so supervise construction as to assure that the contracts are fulfilled. When construction is completed and accepted, then the road is turned over to the operating department, and on the basis that such department is competent, the results obtained depend very largely upon the character or the work which has preceded. A comparatively few extra dollars expended in assuring the best possi-

TABLE NO. 3

COST OF CONDUCTORS.

Based on Copper at 20 cts. per pound. From Table No. 2.

K. W.	Distance of Transmission in Feet.									
	10	20	30	40	50	60	70	80	90	100
100	....	....	....	....	....	....	....	11556	14611	18000
200	....	....	....	....	9022	13000	17667	23056	29222	36090
300	....	....	....	8667	13571	19500	26544	34667	43889	54134
400	....	....	6 00	11555	18040	26000	35344	46111	58444	72179
500	....	3611	8111	14444	22555	32444	44167	57722	73050	40224
600	....	4333	9744	17333	27055	38044	53056	69222	87006	108260
800	1445	5777	13000	23111	36111	51914	70778	92333	116778	144358
1000	1778	7222	16222	28889	45111	65000	88444	115555	146111	180448
1200	2167	8767	10489	34666	54111	77800	106111	13833	175111	210..8
1500	2722	10833	24333	43333	67778	97444	132678	173333	219322	270672
2000	3611	14444	32444	57778	90222	130000	176667	231111	292222	360846

$$3 \times \frac{359100}{300000} \times 5028 \times 100 \times \$0.20 = \$360{,}895.06.$$

TABLE NO. 4

NUMBER OF WIRES, AND SIZE, B. & S. G.

Nearest Size Taken from C. M. Table No. 2. Preference given to larger sizes and even numbers.

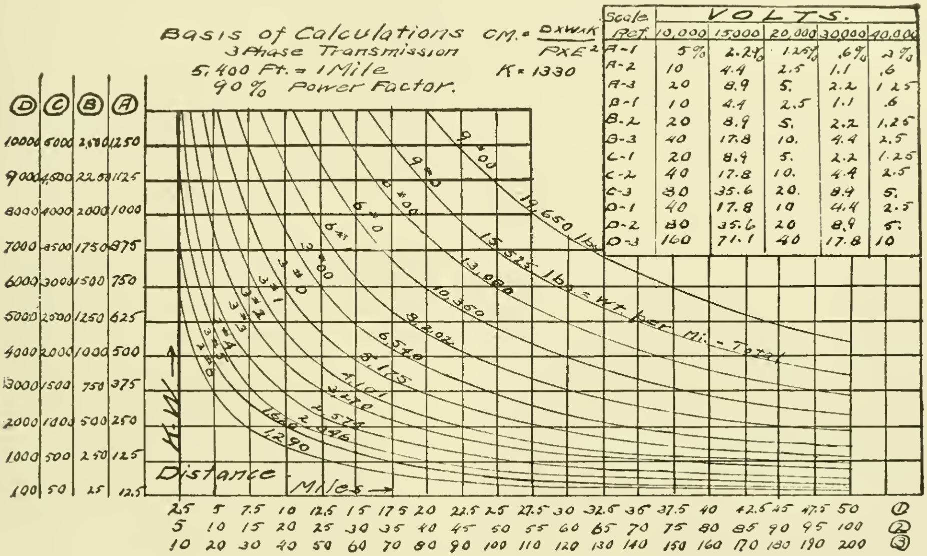
K. W.	Distance of Transmission in Miles.									
	10	20	30	40	50	60	70	80	90	100
	No.	No.	No.	No.	No	No	No.	No	No.	No.
100	......	......	......	......	......	......	......	3— 6	3— 6	3— 6
200	......	......	......	......	3— 6	3— 6	3— 6	3— 6	3— 5	3 - 4
300	......	......	......	3—6	3— 6	3— 5	3— 4	3— 4	3— 3	3— 3
400	......	......	3—6	3—6	3— 4	3— 4	3— 3	3— 2	3— 2	3— 2
500	......	......	3—6	3—4	3— 4	3— 3	3— 2	3— 1	3— 1	3— 0
600	......	3—6	3—5	3—4	3— 3	3— 2	3— 1	3— 1	3— 0	3— 0
800	......	3—5	3—4	3—2	3— 1	3— 1	3— 0	3—00	3—00	3—00
1000	......	3—4	3—3	3—1	3— 0	3— 0	3—00	6— 1	6— 1	6— 0
1200	3—6	3—4	3—2	3—0	3— 0	3—00	6— 1	6— 1	6— 0	6— 0
1500	3—6	3—3	3—1	3—0	3—00	6— 1	6— 0	6— 0	6—00	9— 0
2000	3—4	3—1	3—0	6— 1	6— 0	6— 1	9— 1	9— 0	9— 0	9—00

ble design and construction will probably save many times the interest on such additional expenditure and there is no investment which pays as large dividends as that which can wisely be expended in order to "start right."

Appendix "A."

Since the single-phase alternating current motor has become an accepted fact, it is now, in some cases, advisable to consider plans and to make estimates of cost based both on direct current and on alternating current equipment and such estimates include both first cost and operating expense, as well as the general adaptability of each system to the road in question and a few words on this subject may not be amiss.

The general characteristics of the single-phase alternating current road, as compared with the direct current, are low first cost of line and sub-station equipment, high first cost of car motor equipment and ability to deliver power either to many small units or to a few large units, and in either small or large blocks. The characteristics of the direct current equipment are high first cost equipment of sub-station and line, low cost of car equipment and considerable cost for sub-station attendants and ability to deliver power to a considerable number of units in small blocks, but requiring much greater investment than alternating current when required to deliver large quantities of power to a small number of units.



Scale Ref.	VOLTS.				
	10,000	15,000	20,000	30,000	40,000
A-1	5%	2.2%	1.25%	.6%	.3%
A-2	10	4.4	2.5	1.1	.6
A-3	20	8.9	5.	2.2	1.25
B-1	10	4.4	2.5	1.1	.6
B-2	20	8.9	5.	2.2	1.25
B-3	40	17.8	10.	4.4	2.5
C-1	20	8.9	5.	2.2	1.25
C-2	40	17.8	10.	4.4	2.5
C-3	80	35.6	20.	8.9	5.
D-1	40	17.8	10	4.4	2.5
D-2	80	35.6	20	8.9	5.
D-3	160	71.1	40	17.8	10

Chart No. 1 (Appendix B).

As a result, the alternating current motor system is more especially adapted to the interurban roads where first cost must be the minimum and where the number of cars operating is comparatively small, and also to the operation of trunk lines, freight roads, etc., where there are a small number of heavy trains to be moved, and, therefore, in a general way, for "interurban roads in sparsely settled districts." On the other hand, the direct current equipment is preferable for the city road, the elevated road and suburban roads with heavy traffic and where the number of trains is large.

The interurban road, which is equipped with the single-phase trolley is in a position to handle freight in large units to much better advantage than the road having direct current equipment, as it is not limited as to the amount of power which a trolley wheel can take from the wire, but only as to the maximum load which the sub-station can carry, and in this case, the sub-station equipment is comparatively cheap. It is possible to have a sufficient sub-station capacity to handle heavy freight in addition to the passenger service.

Appendix "B"—Some Convenient Tables and Suggestions Relative to Tables and Curves.

Engineers' hand-books are of great value, but every engineer also has data of his own collecting, which he tabulates and charts in such manner as is most applicable to his work, and most convenient for him. The following tables and curves may be found convenient, and suggestion is made relative to others which are convenient, but are not presented for the reason that they refer to cost, and, like other statistics, would be liable to be incorrectly used.

Interurban roads usually have two trolley wires, and as a 300,000-C. M. feeder (insulated) is the largest solid (not stranded) wire which can be readily handled, it is quite frequently used, and therefore tabulated.

Allowance is made for sag.

Resistance is based on "hard-drawn wire."

The tables require no explanation, except that for loss other than 10 per cent the cross section and weight and cost will be inversely proportional. Tables which, for the reason stated, are not presented are as follows:

Cost of pole lines, various types. Cost of sub-stations, various sizes and numbers, and type of statics, and size and number of rotaries, high tension lightning arresters, wiring, buildings.

Cost of power-houses of various types complete and per kilowatt.

In some cases curves are more convenient for calculation than tables, but not always.

For comparison of results curves are nearly always preferable.

Chart No. 1 shows:

Size of wire and weight (all wires) per mile for transmission lines.

Given the transmission voltage, per cent loss, and kilowatt and distance, look in table under column giving the transmission voltage, find nearest per cent to that desired; look in left-hand column for scale reference, and find the intersection of such references in the curves.

For example, 200,000 V.—5 per cent—20 miles and 750 kw. under 200,000, 5 per cent is given by A-3, and by B-2, and by C-1, and which reference is the easiest to follow depends upon the miles and the kw., "A" being for the least and "D" for the greatest kw. and 1 for the least and 3 for the greatest mileage.

For kw.=750 and if using A-3, follow the horizontal line opposite 750 in "A" column, until over 20 in "3" horizontal line.

Of course the other references give the same result.

Appendix C.

The following table gives the average kilowatt hours per car-mile on various interurban electric railroads. The power consumption given is at the car. All lay-over time is excluded from the schedule speeds.

Roads A, B, C and D operate from the same large terminal city. Roads D and E operate from other cities. Roads A and B are in the Central West. Road F is in the Southwest.

The car equipment used on all these roads except H is of approximately the same character, the cars being from 42 to 45 feet over all and each equipped with four 50-horse-power motors. H is from the test runs made by the Electric Railway Test Commission of the St. Louis Exposition on the Indiana Union Traction Company system.

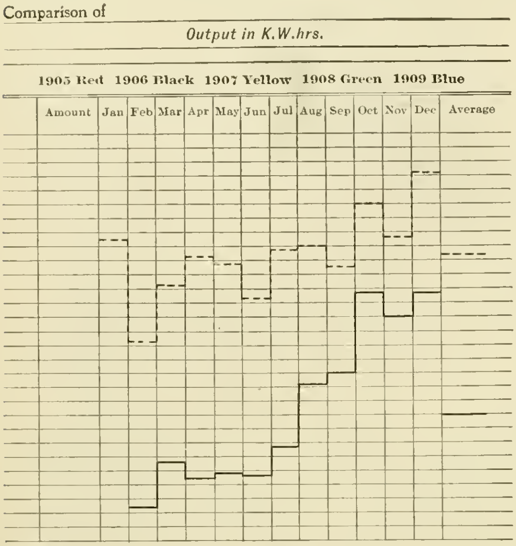


Chart No. 2 (Appendix E.)

The figures may have some interest but are presented to show the quite wide variation and the inaccuracy of accepting averages. A knowledge of the profile, schedules, maximum, and average speeds, number of stops, ratio of motor gearing, voltage on line, etc., explains the variations but without such knowledge the application of any of the results, or their average, would be misleading, and the energy which will be required can be more accurately predetermined for any given road by other methods.

Appendix C.

ROADS.	Schedule speed m. H.	K.W. Hrs. per car mile.	Watt hrs. per ton mile.	Stops per mile on test runs.	Notes.
A......	26.2	2.88	......	.85	Interurban runs only.
A......	10	2.11	......	......	City.
A......	18.1	2.53	......	......	Entire run.
B......	20.5	2.85	......	1.41	Interurban run only.
B......	9.5	2.27	......	......	City run only.
B......	15.2	2.60	......	......	Entire run.
C......	20.4	2.18	......	.70	Interurban run only.
C......	7.9	3.36	......	......	City run only.
C......	10.5	3.48	......	......	City run only
C......	15.1	2.50	......	......	Entire run.
D......	20.6	2.18	......	.56	Interurban run only.
D......	10.1	2.18	......	......	City run only.
D......	18.1	2.18	......	......	Entire run.
E......	20.6	2.16	......	......	Interurban run only.
F......	24.4	1.88	72.3	.54	Entire run.
G......	23.2	2.49	91.75	......	Entire run.
G......	23.3	2.08	78.75	.76	Entire run.
G......	29.1	1.97	74	.3	Interurban run.
G......	19.3	*2.71	63.75	.4	Entire run. Motor and trailer.
H......	28.84	3.34	84.4	**.2	Entire run.
H......	26.8	*4.58	73.8	**.19	Entire run. Motor and trailer.

Appendix D.

Examples of some points referred to in the main paper.

Suppose the road is 50 miles long and is to be designed for passenger and express service, but not for freight, at least to any considerable degree.

Suppose that a 5 per cent maximum ruling grade would cost a certain amount, and that to reduce it to 2 per cent without change of location would cost $250,000 additional, and to one per cent would cost an additional $500,000, as compared with the 2 per cent or $750,000 as compared with 3 per cent.

What should be considered in evaluating the problem?

A—The time saved per train and total of all trains, and what it is worth, if anything.

B—The total energy saved, not on a pro-rata basis, but on the basis of the additional cost for the additional energy.

C—Effect of reduction in grade on capacity of motors; in some cases this may change size of motors, or size and weight of car most advisable.

D—Effect on fluctuation of load and on maximum power required in sub-stations and in power-house. This may affect capacity and number of units. In each case there will be other factors.

Suppose the answer to A is: Time saved per passenger train for reduction of 3 per cent to 1 per cent grade—10 minutes.

What is it worth?

If the result is that the run can be reduced from two hours to one hour and fifty minutes, with ten minutes lay-over for crew (whether or not motor car lay-over is longer), and that in no other way could such result be obtained, then it is worth considerable, and because of the resulting saving in time of train crews.

The saving in time of run may also have some commercial value, but this depends upon the character of competition, and reliable services and confortable cars with smooth riding are more important for obtaining business than a saving of 8 per cent of the time.

Suppose an average daily headway of, hourly—15 hours daily; one-half hourly—5 hour daily. The result in time of train crews lost would be the same as hourly headway for 20 hours daily.

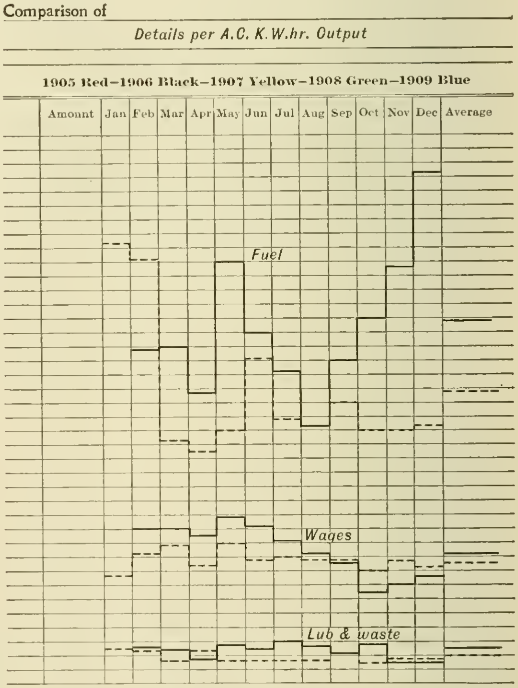


Chart No. 1 (Appendix E.)

If each crew had to lay over one hour out of each trip at each end of the line, the time wasted would be one-third, or, in other words, there would be at all times two trains waiting—one at each end, which at 45 cents per hour per crew is $18 per day and $6,570 per year, which is our interest at 6 per cent on $110,000. Even for this extreme case the lessened grade would not pay at the cost stated.

B—Suppose the energy saved to be at the power house, 5 kilowatt-hours per car-mile and the total car-miles annually to be 912,500; the total kilowatt hours saved are 456,250; if additional cost per kilowatt-hour is 5 cents, the saving is $2,281.25, or 6 per cent on $38,000.00.

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* Kilowatt-hour per train mile, motor and trailer.

** Stops in country—stops in city were .97 and .92 respectively.

The additional cost for the additional energy is mainly for the fuel, but if the range of fluctuations is materially increased by the greater grade, then the result may seriously affect the entire output, possibly in some cases increasing the entire fuel bill 10 per cent or 20 per cent or more.

C—For the case under consideration it is not probable that there would be any actual change in size of motors, but there would be a tendency towards a lessened depreciation of motors.

D—If the additional fluctuations caused by increased grades should make necessary 1,000 kw. sub-station apparatus, at $25 per kw. (for additional, not pro rata, capacity), and 500 kw. additional for the power-house, at $80 per kw. additional, then the total increased cost on such account would be $65,000.

As a matter of fact, apparatus cannot be obtained in capacities having small differences, and the question frequently is, shall the margin capacity or safety be kept down or the next larger size be installed? The former increases efficiency of operation, also depreciation, the latter first cost, ability to handle maximum traffic, and fuel per kilowatt.

The total above obtained are:

A	$110,000
B	38,000
C	65,000
Total	$213,000

Being the equivalent value of the reduction in grade or aprpoximately $400.00 per mile of road.

Suppose A is excessive and takes ½	$ 55,000
Suppose B is not enough and double	76,000
Suppose C not changed	65,000
And also suppose that the lessened average efficiency increases cost of all power	2,000
Total	$198,000

But there are nearly always additional factors to be considered, and the basis taken for each of the foregoing tends to favor reduction more than would usually be the case in practice for passenger interurban railroads; but even with the total of the above it would not be advisable for the stated cost to reduce grades, but the more frequent the services the greater the amount which should be expended to reduce grades.

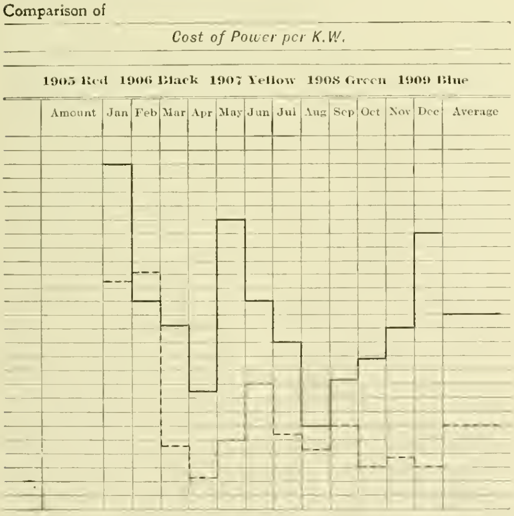


Chart No. 3 (Appendix E.)

This example also indicates the close connection between the civil and electrical engineering departments, although too often it is not taken into account.

As stated in the main paper, the effect of grade on freight trains is more marked than for passenger service.

Appendix E—Recording and Analyzing Statistics Relative to Operation.

Statistics are naturally recorded in tabular form, but for the purpose of comparison it is generally preferable to chart the results, and by so doing variations from month to month and year to year are much more noticeable, both as to character and degree.

The size and ruling of the paper used for charts are immaterial, but we find it convenient to use loose sheets 4x7 inches, and which file in a pocket notebook and are ruled as per sample. The figures placed in the column headed "amount" depend upon the values of the data charted. If there is only a difference of a few thousand dollars between maximum and minimum, then the difference between each horizontal line can be $500 or $1,000. For example: "gross earnings" will probably necessitate a large difference, whereas for oil and waste and some other items, which do not have a great variation, the difference between horizontal lines need not be more than $100.

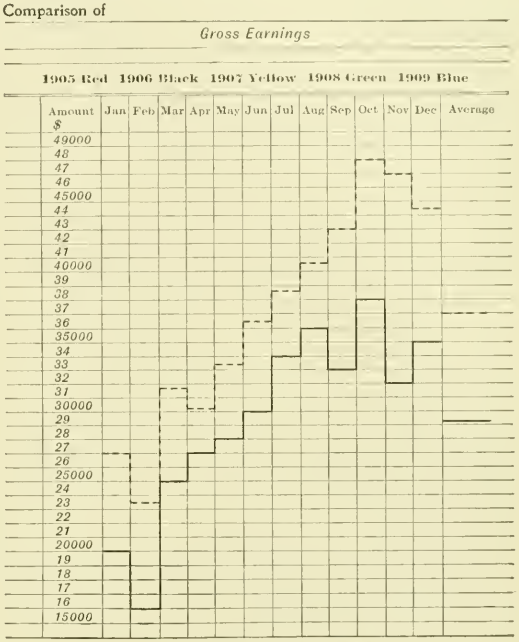


Chart No. 4 (Appendix E).

Based on the books being kept in accordance with the standard of the American Street and Interurban Railway Accountants' Association, we chart the various items so listed and also some additional items and also consolidate some of the items into one chart. For example, we chart car mileage, total and divisions, if any, kilowatt-hours per car mile, power-house and sub-station output in kilowatt-hours, cost, etc.

These are charted from month to month, and also the average for the year. Different colored inks are used for different years, although in the samples herein submitted different character of line is used in order to avoid color printing. Chart No. 1 is presented as a typical example of the use of the chart. Supposing the full line to represent the income for one year and the dotted line the income for the next year, then some of the questions would be as follows:

Referring to the first year it would be noted that February is less than January, and the question would be "why was such the case?" This would be partly answered by the fact that it is a shorter month and also that there is generally considerable holiday riding in January. Reference would also be made to the chart showing "car mileage," and "receipts per car-mile," and if a record is kept on weather conditions, it would also be referred to.

The chart shows a gradual increase during the summer until September is reached. In each case an effort should be made to ascertain the reason for the increase, and when September is reached the reason for the decrease. The latter is also true as to November.

When the second year is charted a reason for the change from month to month should be ascertained and also the reason for any variation in amount from character of monthly change in the preceding year or years.

Similar charts are made for operating expenses, net earnings, fixed charges and not profits. Charts are also made for each item, or, if preferred, in some cases groups of items, tabulated in accordance with the standard of the Accountans' association. In order to obtain full value from such charts it is necessary to compare some of the tables and charts. For example: Take the item of "operation of power plant." It is undoubtedly desirable to know the total, but from the standpoint of analysis it is evidently also necessary to know "total kilowatt-hours delivered to the line, the cost per kilowatt," and the analysis of such latter cost, and also it is advisable to note the total car-mileage, although in some cases, because of the various types of cars, the latter has little, if any, value.

In connection with this, it should be noted that the power-house cost per kilowatt-hour should be based on the kilowatts delivered to the line, and any electrical energy delivered by exciters or used for motor driven apparatus in the power-house should not be included, and special attention is called to this because the latter method is sometimes used.

Evidently if the cost of fuel per kilowatt-hour increases, the reasons should be ascertained. It may be on account of poorer fuel, based on results per dollar, or it may be on account of lighter loads, or not maintaining the generators at as high a ratio of load to rating. Also it may be due to poorer firing, and in this connection a record of boiler feed water is of value. In connection with the last suggested possibility, it should be noted that unless such meters are frequently calibrated that the records may be misleading and consequently worse than none, and this, to a greater or less degree, is true of all registering apparatus. The values of recording apparatus can hardly be over-estimated if it is properly maintained and the records intelligently used, but in too many cases this is not the case.

Nos. 2, 3 and 4 are typical charts of kilowatt output of power-house, and they are for the same plant and years. It is evident that in consideration of them there was ample opportunity for careful study. The costs are not given and the zero line is not at the bottom of each page, but in a general way it will be noted that the output increase and the cost per unit for fuel and for wages decreases.

We believe it to be evident that results can be much more readily compared on charts than by reference to tables.

A few words relative to an additional value of such charting and analyzing may be of interest. Our experience has been that managers and superintendents sometime hesitate relative to the preparation of such charts and the analysis of them, undoubtedly fearing that in some way they will render themselves more liable to adverse criticism, and such may be the case if they are not properly carrying on their work. Sometimes the claim is made that they are doing the best they can, and such records and investigations merely require additional time without giving commensurate benefits. If, however, the charting and analyzing are made by independent parties who not only are confident but also are "big" enough and broad minded enough not to be controlled in their advice by those whom they may hit, the result is beneficial, not only to the railway company but also to the manager and the superintendent, and for the reason that if such men make improvements such fact is and should be called to the attention of the higher officers or the board of directors, and a statement of such character by an independent and specially qualified expert has much greater value than if made by the manager or superintendent. Another and very important point is that not infrequently the manager or superintendent is expected to produce impossible results. The means with which they are provided being insufficient for the purpose, and frequently any statement from them to such effect is considered as an excuse.

We also believe it to be a fact that a competent man, not too closely identified with the operation of possibly only one road, will not only have a broader view but will also make a more searching and well-balanced investigation of the conditions relative to an operating road than is generally possible for even an equally good man who is so close to the operation of the road that he will necessarily be more or less biased by its history, and who, because of constant attention to details and closeness to the work, has lost the perspective.

In conclusion, the writer advises indicating and registering apparatus, proper maintenance of same, complete records and tabulation and charting of such records, and calls special attention to the fact that the value of all them depends entirely upon the analysis of the results, and that the object of such analysis is to increase income, lessen operating expense, or both. In other words to obtain maximum net income.

AN INSTRUCTIVE EXHIBIT.

The booth of the National Brake & Electric Company in Building 3, Section C, Space Nos. 1 to 3 inclusive, is designed in a color scheme of red, green and white, with gold letters. The exhibit of the apparatus is the most complete ever made by this company and is rendered especially attractive by the constant operation of the apparatus. Among the apparatus shown in the New National air compressor, completely assembled, and also with sections of housing cut away, showing the details of construction of the mechanism, its operation and the ready accessibility of all parts. The especially distinctive features of the motor compressor are the construction of the motor and compressor as entirely separate self-contained units; the construction of motor and compressor with a large air space intervening, which prevents radiation of heat of the compressor to the motor; the use of a third bearing on the crank shaft, giving added strength and minimum vibration and, hence, slight noise in operation; the absence of loose bearing brackets, unsightly goose necks and elbows, ample insulation of the brush gear, in addition to many other distinctive features. The New National emergency valve is shown in operation on a two-car equipment. This valve possesses some decidedly novel features and its simplicity is especially noteworthy. The new Type N oil pneumatic governor is also shown in constant operation, and the fewness of its parts, its compactness and freedom from complications, has created much interest from representative railway men. The new engineer's valve is shown automatically operated by a device which moves the handle back and forth. The novel design of the wearing parts arrangement of the new engineer's valve permits of 150,000 applications with but one oiling. A complete two-car schedule O E air brake equipment with automatic features is shown, as well as a complete line of repair parts for formerly made types of compressors and other air brake apparatus; also repair parts for new and improved types. The portable compressor outfit shown presents a very handsome and substantial appearance, its rugged construction being especially noteworthy. The frame which carries the compressor and its auxiliary apparatus is of channel iron to withstand the hardest kind of service. This outfit is also equipped with the new oil pneumatic governor, in which the weakest point of most types of governors—burning and pitting of contacts—is entirely obviated by the oil which surrounds the electrical contacts and all wearing parts. The company's new line of Type N. L. motors is shown in sizes from 3 to 40 horse-power inclusive. These motors are especially designed to meet the growing demand for motors for machine tool applications. Bulletins on all apparatus on exhibition, as well as bulletins of electrical machinery are on hand for distribution. The National company is represented by S. I. Wailes, sales manager; R. P. Tell, general manager; W. L. Waters, chief engineer; Griffith Johnson, general superintendent; J. T. Cunningham, New York representative; C. N. Leet, Bert Aikman, W. M. Bisel and W. H. Beattys, Jr., of the Chicago office; George S. Hastings, Cleveland representative; J. T. Perry, of the San Francisco office; W. H. Goble, of the Philadelphia office; Arthur Jones, of the Arthur Jones Company, Illinois representative; R. W. Woodward, of the Milwaukee office, and R. W. Hutchinson, Jr., manager of the publicity department.

The Western Electric Company was recently awarded the contract by the Metropolitan West Side Elevated Railroad Company, of Chicago, Illinois, for furnishing 200 series direct-current lamps designed to operate five in series on 550 to 600 volts. These lamps are of the power-circuit type, and are being used quite extensively for operation on street railway circuits.

IN THE EXHIBITION HALLS

The Lord Electric Company, of Boston, Mass., manufacturer of railway specialties, is distributing as a souvenir a very convenient letter opener, in the handle of which is a pair of dies for stamping checks to make trouble for the forger.

* * *

For the first time at any convention there is exhibited in the General Electric Company's space a commutating pole motor for railway use. This motor is known as the GE 100 and has a normal rating of 100 horsepower. In selecting line material for exhibiting at Columbus, the General Electric Company brought only some of its latest devices, particular attention being paid to the subject of catenary construction. A few other general railway supplies including a sample board of rail bonds, are also shown. One of the most ingenious devices is the large capacity automatic current breaker shown. This device consists of a motor operated circuit breaker in combination with a main switch, also motor operated. It has a capacity of 12,000 amperes at 650 volts. The circuit breaker and switch may be controlled from a distance, being necessary to run only one wire from the switchboard to the point of control.

* * *

The Liberty Bell Company, of Bristol, Conn., has a neat and attractive exhibit in Building 3, showing a new line of harps, which is attracting much attention. The cushion harp, which is designed to protect switches and to enable the trolley wheel to stay on the wire at the curves is a noticeable feature of the exhibit. It is claimed that this cushion feature avoids the jarring and bumping that throws the wheel off the wire and that its flexibility enables it with ease to follow curves. A line of wheels is also shown at this booth and it is said they are made of the sort of material that brings repeat orders. Mr. M. J. Horton, sales manager, and E. D. Rockwell, general manager, are present to explain these devices and while their line has been on the market only a short time they claim to have solved the problem, for many roads where the conditions were very exacting.

* * *

In addition to the representatives of Allis-Chalmers Company, mentioned in our first issue, others who have appeared on the exhibition grounds are B. A. Behrend, chief electrical engineer; David Hall, assistant chief electrical engineer; Mr. E. Mattman, chief draughtsman in the electrical departmeut; Louis Bogen, engineer of the electrical sales department; W. P. Spellmire, of the Pittsburg district office; A. Brodock, of the air brake department; Fred Webster, of the Chicago district office; W. H. Powell and W. J. Richards, electrical engineers; A. M. Libby, of the Boston district office; W. D. Pomeroy, superintendent, and B. Ellshoft, foreman in the electrical works at Cincinnati.

* * *

An exhibit which is attracting much attention among the visiting railway men is that of the Niles Car & Manufacturing Company on the tracks near Machinery Hall. Two special limited cars, which are about to be delivered to the Columbus, Delaware & Marion Railway, will be kept on exhibition here throughout the convention week, besides an especially fine car recently ordered by the Aurora, Elgin & Chicago railroad. The special features of the Columbus, Delaware & Marion cars are in the finish, furnishings and arrangement of compartments, the framing and concealed portions being Niles standard construction. Reversing the usual practice, the baggage room is located in the rear and the main passenger compartment in front, with smoking compartment between, opening into the baggage compartment. The men's toilet room is in the rear vestibule with entrance from the baggage room; the ladies' toilet has an inconspicuous entrance from the corridor. The motorman's cab is separated by a partition from the passenger exit and all doors are on one side. The bottom frame has six steel beams, the full length of the car, and the floor is triple. The interior is finished in mahogany and the ceiling is of the full empire type. The furniture consists of movable reed chairs. The cars are 67 feet long over buffers and have a seating capacity for 40 persons. The Aurora, Elgin & Chicago car is very handsomely finished inside and out. The main passenger compartment is situated in the front and the smoking compartment in the rear. Both contain comfortable leather-upholstered cross seats. The ceiling is full empire style and the lamps are contained in ornate hemispheres. Both cars are mounted on Baldwin No. 125 tracks.

• • •

W. T. Van Dorn, president of the W. T. Van Dorn Company, Chicago, has on exhibit here a model of an all steel box freight car, patents on which have been issued to him recently. The design provides for an underframe of pressed steel shapes of dimensions to meet the requirements of the Master Car Builders' Association. For supporting the sides and roof the posts and the carline are combined in a single length of rolled T-section bent to the proper shape. At the top of the roof, inside, is a T-section which is the only longitudinal member required for the roof framing. The sides and ends of the car are made of circular—corrugated metal. Plates for the ends have a single of concentric corrugations, while the plates forming the side coverings of the car have two sets of concentric corrugations for each section, the diameter of the largest corrugation in each set being approximately equal to the width of the plate. Corrugating metal in this manner is claimed to increase its resistance to distortion three-fold. A marked advantage of this type of construction lies in the increased space contained inside the car, there being a gain of two feet in length inside and about six inches in the width inside. The weight of the car is no greater than that of modern box car of heavy construction.

* * *

The U. S Engineering Company are exhibiting a model of the Nachod automatic signal, which reproduces the actual operating conditions. The signal has but one line wire and admits a number of cars on the block; the first in setting the signals, and the last out clearing them automatically.

* * *

W. B. Stone is not selling glass as was indicated by an item in our publication Thursday, but is representing the E. W. Bliss Company of Brooklyn, N. Y., manufacturers of motor gears and pinions.

* * *

Henry L. Shippy, of John A. Roebling's Sons Company, is conspicuous by his absence. For years he has been the chief feature of the Roebling exhibit at the many conventions, and all his old friends are inquiring for him.

* * *

Those delegates desirous of having some good literature to read on the train as they go home will be supplied with a handbook containing brief articles on typical chloride accumulation installations and other useful general technical information at the booth of the Electrical Storage Battery Company, of Philadelphia. The representatives of this company present at the convention are H. B. Gay, G. H. Atkin, R. C. Rull and H. H. Atkin.

* * *

The J. A. Fay & Egan Company, Cincinnati, O., manufacturers of woodworking machinery is exhibiting its new No. 144 hollow chisel mortiser and its new No. 50 band saw and it also makes a complete line of machinery for car shops. It is represented at the convention by Messrs. C. P. Egan and F. F. Sexton.

* * *

The exhibit of the Standard Steel Works, Philadelphia, is of itself an exhibit of the state of the art to which interurban and urban electric traction has advanced. The display shows rolled steel wheels of urban, interurban and M. C. B. section and steel tires of corresponding sections on castiron centers, as well as motor axles and etchings illustrating cross sections of tires and rolled wheels. The striking feature is that to the casual observer there is so little difference in appearance between the parts designed for steam roads and for electric service, though as a matter of fact each has special features adapting it more particularly to a certain class of service.

* * *

The Climax Stock Guard Company's booth in Building No. 6, Section B, space 15, is as usual, interesting to railway officials. Besides the clay guards made by this company there is exhibited a steel farm crossing gate, the principal feature of which is the provision made for raising or lowering the outer end by a ring which slides back and forth on the cross bar and around the truss wires. Each wire in the gate is connected to the frame by an adjustable device which allows the sag to be taken up. F. W. Stewart and Fred V. Stewart are representing the company at the convention.

* * *

Near the exit of Building 6, may be seen the exhibit of the Harrison Safety Boiler Works, of Philadelphia. Mr. J. E. Harris is in charge of this exhibit and is pleased to tell interested callers about the merits of the Cochrane feed water heater and Cochrane steam and oil seperators, as well as the large Cochrane system of water purification. Their 300 horse power heater and receiver and their four-inch horizontal steam seperator are installed in this exhibit. These appliances are in service in many railway power plants and this company reports a large and increasing business in the electric railway field. A. Sorge, Jr., of Chicago, has also been in attendance at the convention.

* * *

Mr. H. M. Perry has charge of the exhibit of the Perry Side Bearing Company, of Kalamazoo, Mich. This firm has for several years been favorably known in the steam railway field but has only recently entered the electric railway field. The exhibit consists of several of the firm's roller side bearings, designed especially for use on street and interurban railways. During the week the bearings have attracted an unusual amount of attention among electric railway men and trial orders have been placed from various sections of the United States.

* * *

During the week the Magann Air Brake Company, of Detroit and Toronto, has made at its booth in Building No. 6, many practical demonstrations of its air brakes and air brake equipment. This company has the floor of a car located in its booth in such a way that the automatically operated motor and chain driven tandem compound air compressor, as well as the application and workings of the brake gear can be plainly seen. The compressor is self contained, has automatic lubrication and a water circulation pump. The representatives of the company are W. K. Omick, F. Y. Harrison and Richard Kroll.

* * *

The C. Lee Cook Manufacturing Company, of Louisville, Ky., have on exhibition at its space in Section C, of Building 6, a quantity of Cook's metallic packing, to be used on some of the largest blowing engines in the world. The packing is said to be adaptable to all classes of service, saturated and superheated steam, and is in use exclusively in some of the most prominent power plants in the country, among which are those of the New York subway, Chicago Edison Company, Union Electric Light & Power Company, St. Louis; Cincinnati Gas & Electric Company, United Railways of St. Louis, Detroit United Railways, Twin City Rapid Transit Company, Minneapolis and the Louisville Railway Company. The company is serving to all its friends good old Kentucky cider, and Mr. Robert C. Baldwin, manager, is in attendance to explain the Cook Metallic packing to all who are interested.

* * *

The wheel-truing brake shoe which is now used on more than 800 railways is exhibited in a handsome booth just opposite the door leading out of Building No. 1. This shoe is manufactured by the Wheel Truing Brake Shoe Company of Detroit, Mich., and the careful attention it has had at the hands of Dr. J. M. Griffin, president and general manager of this company has brought the railways to a realization of the usefulness of this wheel truing shoe. Dr. Griffin has the right idea about a booth as will be seen when you visit the exhibit. Those handsome nickel plated posts and railings that enclose his space are all detachable and capable of being made into a booth of twice the dimensions. Even the table can be taken apart and stored away in a very small space for shipment.

* * *

The acme of exhibitor's art is catching and holding the attention of a visitor, but how much greater is he who holds the visitor's reflection is a fair guess. The art of Charles H. Spotts, of the Dixon Crucible Company, does both. Happy may be the man who has the gift of seeing himself as others see him, but he may well be thankful that no one sees him as he sees himself in the Dixon exhibit space. When Hamlet said to his dad's ghost, "Thou comest to me in questionable shape," he had not seen Dixon's exhibit or he would not have questioned anything he saw. As for the rest, it is hardly necessary to mention the well known Dixon crucible products. They have added lustre to other towns than Jersey City. From silica-graphite paint to plumbago crucibles and American graphite pencils to commutator compounds extremes meet.

* * *

The James G. Wilson Manufacturing Company has, in Building No. 6, its newest device in the way of a rolling door. This is a swinging or reciprocating mechanism causing the shaft to move backward and forward from the top of the opening as the door opens and closes. The company is also showing a rolling door with wire glass panels.

* * *

The American Water Softener Company, of Philadelphia, has four of its water softening plants in operation on railroads in the city of Columbus, besides several industrial plants. Photographs and other data of these installations may be seen in the booth in Building 6.

* * *

The penalty of success is imitation. The unconscious homage of "just as good as Pantasote" is the unearned increment of persistent advertising of an article that has proved its worth until it is admitted by all who are competent to judge of degrees of merit.

* * *

The exhibit of the D. & W. Fuse Company, of Providence, R. I., is not a large one but the line of material is attracting much favorable attention. Practical demonstrations are being made showing the comparative heat resistance properties of the company's Deltabeston magnet wire as against the double covered cotton wire. The Deltabeston magnet wire is covered with asbestos, and is shown in sample coils used for this demonstration. In the fuse line may be seen service switches, entrance cut-outs, transformer cut-outs, railway motor cut-outs and subway boxes. For the Deltabeston magnet wire there is claimed a great saving in the maintenance account. The company is represented by W. S. Sisson, secretary, and C. E. Harmon.

* * *

Mr. C. G. Young, construction manager of J. G. White & Co., of New York, is attending the convention, and is quite willing to be shown anything in the line of construction material.

* * *

Back platform accidents represent a large proportion of the claims requiring adjustment by the claim agents. Under certain conditions a platform gate is an absolute necessity. The objections to them have been overcome by the Wood's Safety Car Gate made by the R. Bliss Manufacturing Company, of Pawtucket, R. I., of which more than 5,000 are in use. It is shown that the gate reduces the time of stops; it is neat and strong, and never out of order.

* * *

In the exhibit of the National Lock Washer Company, of Newark, N. J., is shown a pair of locks which have been in service for three years. These locks being made of a metal so hard that it will not wear and soft enough so that it will not chip, are remarkable samples of the lock-maker's art. Since the mechanism of the window fixtures made by this company is such that the sash is held and locked at any height it is easily seen that the strain is taken by the lock. The National sash face springs, arranged four in a set, are applied one to each corner of the sash set in pockets cut in the sash. The springs bear against the inside sash stops, pressing firmly against the inside stops, and are hidden from view. These springs do away with the necessity of weather-stripping the outside of the windows, make the window practically dust and draught proof, prevent the sash rattling, and allow the inside stops to be applied loosely enough to prevent the sash from swelling tight. They are light steel springs, having a double foot bearing, and are made of the finest tempered steel, and while they make the sash run snugly there is never any sticking or binding.

* * *

American Locomotive Company announces that on account of the increasing demand for trucks for heavy electric traction, a new department has been organized to carry on the manufacture and development of motor and trailer trucks for electric motor cars and for electric locomotives. The company is prepared to submit drawings and specifications, together with propositions for building trucks for all classes and conditions of service and maintenance facilities, either from its own designs or in accordance with designs and ideas furnished by railroad companies. The headquarters of the electric locomotive and truck department will be at Schenectady, N. Y. Mr. Wm. Wampler has been appointed sales agent and H. B. Hewet, manager.

* * *

The O. M. Edwards Company whose well known window fixtures are in such wide use on steam roads finds that the information with regard to its latest new designs has not spread in street railway circles to the extent it desires. The old device made by this company was, in certain ways, expensive. The more recent designs are much more effective than ordinary window fittings and may be installed at about the same price.

* * *

One of the interesting exhibits that can be found in Building No. 6, is that of the Cary Automatic Coupler Company, of Chicago. This company is showing its automatic car and train pipe couplers which are designed to make both the drawbar and air connections between two cars without previous adjustment. The representatives are Mr. Clarence W. Taylor and Boleslau R. Kozlowski.

* * *

Although the exhibit of the S. F. Bowser Company, of Fort Wayne, Ind., was slow in arriving at the exhibition halls, the firm succeeded in getting it in order before the opening of displays on the second day of the convention. The representatives have since been busy pointing out the superior qualities of the goods displayed. In the display can be found a self-measuring pump, oil cabinets and oil tanks. The Bowser adjustable measure oil cabinet is peculiarly adopted for factories, shops and power houses, or any place where lubricating oil is used. The pump used in connection with it can be adjusted so that it will exactly fill the oiler or cans, thus preventing an overflow or waste of oil. The tanks are built of heavy galvanized sheet steel, riveted and soldered throughout. The representatives of the company who can be found at the booth are Mr. W. T. Simpson and Mr. C. A. Gridley. Mr. Gridley is to have full charge of the sales department for electric railways.

* * *

The Wallace Supply Company, of Chicago, has an interesting display in Building 4. Among the exhibits can be found many of the well known supplies for railway use that are handled by this firm, including an assortment of bending tools, re-enforced Stanwood car steps, steel gongs and other things too numerous to mention in detail. It is interesting to learn that the Stanwood step was ordered placed on 250 new cars recently ordered by the United Railways Company of San Francisco. The Wallace Supply Company is the exclusive sales agent of this step. Another interesting device that can be found in the booth is a mechanism for operating car doors by compressed air, of which Mr. J. E. Osmer, of Chicago, is patentee. This has already, though it has never been placed on the market, received the approval of a large number of railway men. A car coupler known as the S. & W. type is another interesting exhibit. This coupler has open throatways in each of which is carried a link, the cross section of which is four times as great as the length of any other coupler. The open throat permits a vertical movement of six inches, enabling the coupler to take care of any variation in the height of cars. This type of coupler has been adopted as standard by the Northwestern Elevated Railroad Company in Chicago, and is in use on the London underground railroad. The booth of the Wallace Supply Company is in charge of Wesley Meeteer, Carl Merterharsen and Burton R. Stare.

* * *

The booth occupied by Cook's Railway Appliance Company is a Mecca for railway construction and operation men. Among the interesting devices on exhibition are a portable track grinder, fitted with an accurate device for guiding the work, grinding bits, track chisels and other tools. The grinder is of a substantial design and can be rigged up on a hand-car, track drill or bench. This company is also showing a large assortment of track drills, car and track jacks and a wood and steel cattle guard. Eugene E. Cook and H. W. Bissell are in charge of the exhibition.

* * *

The National Brake Company of Buffalo, makers of the Peacock brake, has on exhibition at its booth in Building No. 2, six models in aluminum, cast from the regular patterns of the brake, showing in full size the various types of brakes made by it. It also has two of the brakes mounted on platforms, so that the actual operation of the brake can be shown. The fact that fully 90 per cent of new cars being built are equipped with these brakes, speaks well for the energy with which the representatives of this company have, within two years, made them standard on so many lines. The company has recently closed a contract with the St. Louis Car Company, whereby the latter makes the Peacock brake its standard gear brake, and since this convention opened has received from it an order for 200 brakes for immediate delivery. The company is represented at the convention by Messrs. G. S. Ackley, president; W. D. Brewster, secretary; F. D. Miller, treasurer; W. W. Miller, manager St. Louis office; J. A. Edwards, metropolitan district and New England, and E. C. Rutherford, of Canada.

* * *

Follow the foot-prints in Building 4 and 5. They lead to the booth of W. N. Matthews & Brother, in Building 6, where all visitors are presented with a useful souvenir in the form of a rubber watch guard.

* * *

Visitors at the attractive booth of the Electric Service Supplies Company are being presented with a very handsome leather pocket note-book as a souvenir. Note-book souvenirs are always useful. Review reporters use them almost exclusively.

* * *

The Automatic Street Indicating Company, of Cleveland, is giving its visitors an aluminum pocket comb.

* * *

You may get handed a lemon at the booth of H. P. Harrison Electric Manufacturing Company of New York but it is a mild one and you may enjoy passing it on to others.

* * *

The booth occupied by the Electric Service Supplies Company is one of the handsomest ever seen at a convention and is divided off into sections, the first being occupied by the well known protected rail bond and the appliances, such as drills, hydraulic compressing tools, for their installation. The second section is given over to a display of "Keystone" overhead insulation, Stombaugh and Miller guy anchors, Hunter illuminated car signs and bond-testing sets. In the third division are shown car brooms and brushes, Brady motor bearings, conductors' badges and buttons and Dossert line connectors. The fourth section is used for the display of all kinds of line construction material, including Locke high-tension insulators and Kearney clamps, armature and field coils, G. D. trolley pick-ups, all styles of the famous Lyon sheet steel gear case, Packard and Columbia incandescent lamps for all services, metal street signs and vestibule shades. The fifth section contains arc lamps and their various accessories, tools of all kinds, a full line of alternating current and direct current Garton-Daniels lightning arresters and a display board of Noark fuses, car lighting fixtures, headlights, tail lamps and conductors' lanterns. Near the railing enclosing the exhibit are shown various styles of the automotoneer, a device for effectively controlling the feeding of current on electric cars. This device was exhibited on controllers of K-6, K-11, K-114, B-18 and Egrain 34 types. The company's city headquarters at the Southern hotel, parlors D and C, where, during the evenings friends are received.

* * *

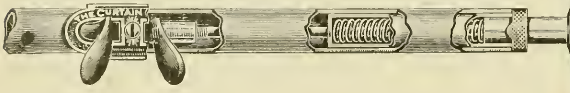
The L. M. Booth Company is exhibiting by means of drawings and photographs the Kennicott Walter Softener, as supplied for use on railways. The exhibition includes some very attractive drawings and photographs of the water softener. The exhibit is in charge of L. M. Booth, E. Richardson and Frank S. Dunham.

* * *

One of the most popular souvenirs seen at the convention is the cane given by the Pittsburg Steel Company at its exhibit in Building 6. The cane is in the form of a long wire nail, of the same material as the company's wire fencing, with bows of ribbon of the national colors at the head.

ADJUSTING MECHANISM FOR CURTAIN FIXTURE.

The accompanying illustration is a cut-away view showing the adjusting mechanism of "Forsyth No. 86," curtain fixture, manufactured by the Curtain Supply Company, of Chicago, Ill. This company's exhibit includes many other styles of fixtures which may be seen as full-sized working models. The representatives of this company, Messrs. Whipple and Hayes, will be pleased to explain in detail the merits of these fixtures, to any who may call at the Curtain Supply Company's exhibit.



Cut-Away View Showing Adjusting Mechanism for Curtain Fixture.

THE STANDARD STEEL WORKS.

The Standard Steel Works is situated at Burnham, about three miles from Lewistown, Pa. A forge was established on the site of the present works in 1795, and the industry has been continuously carried on since that date. The present company was incorporated in 1875.

The Standard Steel Works manufactures iron and steel castings, forgings, tires, wheels and springs. A complete plant has recently been established for the manufacture of rolled steel wheels. This plant has a capacity for 300 wheels per day, and is fully equipped with hydraulic presses and rolling mills. The wheels are forged and rolled from billets cut from specially selected steel ingots, insuring homogeneous material. The rolling process is thorough covering the web, rim and tread of the wheel. Owing to the carefully selected materials, and the process of manufacture, these wheels are as strong as steel tired wheels, while their cost is considerably less. They are particularly suitable for severe railway service, as on electric trucks having heavy motors rigidly supported by the axles and wheels. When, because of long usage, the tread of a rolled wheel is worn so thin that further turning is impossible, the flange may be turned off and a tire shrunk on This is an important advantage in the use of these wheels. This plant also manufactures a complete line of steel tired wheels, having either spoke or plate centers and is also prepared to furnish all forms of railway springs.

THE STANDARD MOTOR TRUCK.

The trucks for electric cars exhibited by the Standard Motor Truck Company, of Pittsburg, include in their construction a number of original and ingenious details which were designed by their superintendent, Mr. W. G. Price. Some of these will not be noticed by the casual observer, but they are clearly explained to all visitors by Mr. Price. The truck itself is exceedingly simple in general design, the main frame and the other principal members being made of plain steel forgings or of standard structural shapes. As a result of this the weight of a motor truck for large cars is about 3000 pounds less than that built by most of the other companies. The method of suspension is new. There is no inside pedestal but in its usual place there is a bracket on the side of the journal box upon which rests the equalizer spring and the equalizers are bolted to the bracket. The box and equalizers are therefore integral and the load is transmitted to them as a rigid structure, from the main frame. The bent portion of the main frame, with a light chafing piece forms the outer pedestal and there is very little weight in the pedestals and much of the usual pedestal wear is avoided.

Another new feature in this truck is the method of suspending the brake shoes. The bracket which supports them is bolted between the equalizer bars so that the position of the shoes is maintained at fixed distance from the rail. They do not have the vertical motion which attends the suspension of brake shoes from the truck bolster in the usual manner. The brake shoe slack adjuster which is used on these trucks should be carefully inspected by all who are interested in electric car service, as it is an exceedingly simple and effective device, and like all of Mr. Price's inventions is boldly original. The mechanism of the adjuster is contained in an extra strong tube, well protected from dust and dirt. The automatic feature is obtained by machine finished rachet teeth, which engage and turn the adjusting screw when shoes are worn so as to require a change in the length of the adjusting bar. The side motion of the truck bolster is restricted by a friction device made of steel plates, which offer sufficient resistance to prevent unusual oscillation on bad track and curves. The side bearings are built of washers which may be removed for adjustment when the car settles. The whole truck is the result of a long experience with lectric car service, and it will be found well worth a careful inspection. One of the heavy motor truck exhibits at Columbus is similar to those used on the Pittsburg and Butler Street Railway—which is to operate at a rate of 60 miles per hour over private right of way. These trucks are designed to carry a car body weighing 64,000 pounds.

PRODUCTS OF THE LORD ELECTRIC COMPANY.

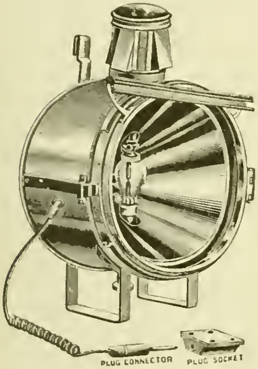
In Space 25, Section B, Building 3, the Lord Electric Company is displaying products of its railway department. Several types of soldered rail bonds are shown as loose samples. Others are applied to various rail sections showing how they are adapted to the varying conditions which have to be met, including track equipped with plain angle bars as well as improved joints. Tools for the installation of these bonds are also shown.

Several sizes of Shaw "Non-Arcing" lightning arresters are displayed. These intruments are made for all voltages, both alternating and direct current. Illustrated bulletins describing these specialties are being distributed, together with a very useful souvenir in the form of a check protector and paper knife. The booth is tastefully decorated in red and white. A large white enamel sample board in the form of the company's trade mark is quite conspicuous. Mr. Edward M.

Hamlin, manager railway department, Mr. George B. Crane and Mr. George W. Smith are in attendance.

ARC AND INCANDESCENT ELECTRIC HEADLIGHTS.

At the Exhibit of the Adams & Westlake Company, in Building 4, Section B. Spaces 26-27, are found the various styles of headlights, both arc and incandescent, used in all classes of electric railway service. This field has been widely developed, so that today this company is furnishing headlights to meet any and all requirements.



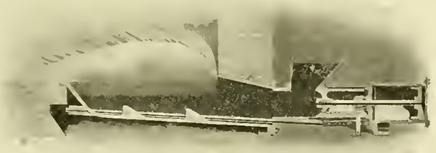
Mosher Arc Headlight.

The Mosher, Wagenhals and Rex arc headlights are well known and standard on many hundred of miles of interurban railways, while the Neal "Set-in" dash headlights are widely used on many city line cars. This company has recently issued a very complete catalogue entirely devoted to this subject. Other catalogues, as well as this, will be mailed on application to the Chicago office of the Adams & Westlake Company.

THE JONES UNDER-FEED SYSTEM OF BOILER FIRING.

Between January 1, 1906, and June 30, 1906, the Under-Feed Stoker Company of America reports that it sold Jones stoker equipments for 56,000 boiler horsepower. The significant feature, however, is not alone in the volume of sales but in the fact that 55 per cent of this total consisted of repeat orders. Orders to the extent noted from former customers indicate that the original investment must have been a satisfactory one.

The Jones under-feed system is said to be particularly adapted to electric station service where loads are necessarily uneven. The fuel and air supply in this system are directly proportioned to each other and to varying loads by the steam pressure itself. The coal is burned in accordance with the natural laws governing combustion, which require that air in proper portion be supplied to the fuel at the right point to produce perfect combustion. Every-day instances of the necessity of this proper proportioning of fuel and air supply may be witnessed in the ordinary Welsbach reading lamp; the "mixer" on the kitchen gas range, in the gasoline engines used for automobile or launch service; and even in the common kerosene lamp.



Cut-Away View of Jones Under-Feed Stoker.

A large proportion of the sales credited to the Under-Feed Stoker Company of America is for electric railway and central station plants. In the railway field we note the following companies using this system of boiler firing: Milwaukee Electric Railway & Light Company, 90 Stokers, 5 orders; Lima & Toledo Traction Company; Winona, Minn. Railway & Light Company, two orders; Georgia Railway & Electric Company, 30 Stokers, three orders; Winnebago Traction Company; St. Louis & Suburban Railway Company, 45 Stokers, five orders.

NEW ROLLING STOCK FOR STROUDSBURG, PA.

The car shown in the illustration is a recent addition to the rolling stock of the Stroudsburg Passenger Railway, and was built in the works of the John Stephenson Company. The other cars operated by this company are all of the Brill manufacture and like the one now shipped contain that company's grooveless-post semi-convertible feature. The seats are of Brill manufacture as are also numerous specialties that go to make up the car's equipment. Oak forms the interior finish and the ceilings are of three-ply birch. The car body is mounted on the Brill "Eureka" maximum traction truck, with a wheel base of four feet. Four motors of 40 horse-power capacity each were installed on the car. The principal dimensions are: Length over end panels 25 feet, 4 inches, and over vestibules, 34 feet, 9 inches; width over sills, including plates, 7 feet, 11½ inches; width over posts at belt, 8 feet, 2 inches; height from floor to ceiling, 8 feet 3⅝ inches; height from track to under side of sills, 1 foot, 10⅜ inches; height from track to platform step, 1 foot, 3 inches. The seats measure 36 inches and the width of aisle is 21 inches.

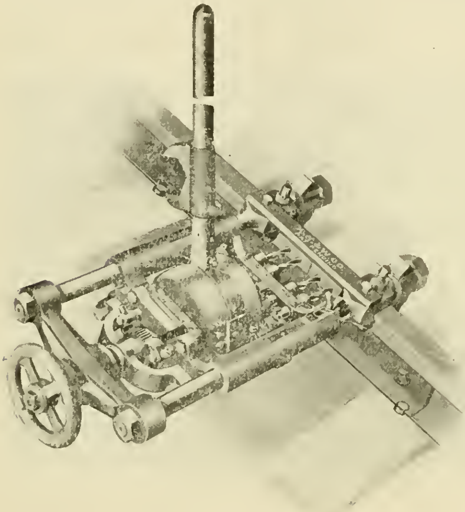
Interior of Brill Car for Stroudsburg Passenger Railway.

BERRY BROTHERS, LTD., VARNISHES.

In every field it is necessary for the successful ones constantly to exert strong efforts in order to keep pace with the spirit of our progressive times, and in its field, the making of varnishes, Berry Brothers, Ltd., of Detroit, has had in view the maintaining of its position as a pioneer. This concern began business in 1858 in a very modest way and has, from time to time, as circumstances warranted, enlarged its plant and the scope of its business. As new needs have arisen they have been met with new products. One of these, which has had much to do in maintaining the reputation of the manufacturer, is the Luxeberry wood finish, which is now registered as the trade-mark of the maker. This varnish was first developed nearly 40 years ago under the name of hard oil-finish. Liquid granite is the name of another varnish finish that has added greatly to the prestige of the company. This finish has a tenacious toughness that makes it specially adapted for floors and other surfaces where it is subjected to hard and constant wear. Another specialty of the Berry Bros., Ltd., which is receiving favorable attention, is shingle-tint, the use of which is explained by its name. This is made in all colors. The concern manufactures varnishes of every kind for exterior and interior finish of cars that have demonstrated the most satisfactory wearing qualities and brilliancy in general usage, and its rubbing and flooring varnishes are known wherever railroads run. Berry Brothers, Ltd., besides the large plant at Detroit, own a factory at Walkerville, Ont., which is maintained to supply the Canadian trade. They also maintain branch offices and warehouses at New York, Boston, Philadelphia, Baltimore, Chicago, Cincinnati, St. Louis, San Francisco, Toronto, Ont., and Montreal, Quebec.

RAIL BONDING TOOL.

The four-spindle drill herewith illustrated has been developed by the American Steel & Wire Company for applying its new Twin terminal bonds. It is rigidly attached to the rail without disturbing the joint plates, and tools four one-half inch bond holes simultaneously in the head of the rail. The lever is double-acting and is said to be easier to operate than a crank. Ball bearings, automatic positive feed, independent adjustment of each drill, frictionless gearing and rigidity of attachment to the rail, all combine to make this tool unique in ease and speed of operation.



Four-Spindle Drill.

The details here shown have been adopted with equally satisfactory results to single, double and triple spindle drills for all methods of rail bonding with stud terminals.

With like thoroughness this progressive company has developed a complete line of tools for installing all standard types of rail bonds and has just issued a most attractive catalogue in which all their bonds and tools are illustrated.

AN IMPROVED SAFETY VALVE.

In developing its new type "E" safety valve, the Westinghouse Traction Brake Company has succeeded in overcoming obstacles heretofore thought insurmountable. These were a slow opening of the valves and consequent building up of a much higher pressure than was desired and a dropping of this pressure to five or ten pounds below the desired point when closing. This new valve not only retains its setting at a definite point, but when opening is "popped" off its seat, making a full and definite exhaust, preventing any accumulation of excess pressure. When closing, it does so with a snap, a range of two pounds being standard; but to suit special conditions an adjustable collar is provided, which permits of any desired range being easily obtained, by simply regulating the rate at which pressure increases above the valve this pressure, assisting the spring in the closing operation.

The advantages derived from this valve are obvious, not only in stationary plants, but in every branch of railway service where it is always essential to prevent pressures in main reservoirs and brake-cylinders from rising above definite points and also from dropping below them when the excess air is allowed to escape.

This type "E" safety valve is claimed to perform its duty, not only reliably and accurately, but also economically, and at the expense of no complications whatever.

The Jones-Laughlin Steel Company exhibit cold rolled finished axles and axle blanks made from special low phosphorus steel, showing key seating and finished details with full description of qualities and tests. It is represented by Messrs. E. D. Balchelor, G. B. Mitchell and C. H. L'Hommedieu.

* * *

The George W. Lord Company, of Philadelphia, which makes a specialty of treating feed water for boiler use is distributing at the convention a booklet having that subject as a text.

* * *

One of the interesting booths is that of the Heany Fire Proof Wire Company, of York, Pa. This company is making a wire wound with white asbestos composition for arc lamps, armatures, fields, transformers, lifting magnets, automatic switch and signal coils. It is stated that no pitch, oils or other objectionable substance are used in making it, and that it is readily water-proofed. Apparatus wound with this insulated wire is indestructible and cannot burn out unless the copper itself melts. Repair expense and shut down losses are reduced to a minimum.

* * *

Anyone can see through the exhibit of Semon, Bache & Company at a glance, for it consists of a number of samples of their glass, made especially for electric railway car service. In order to show this glass to the best advantage they have installed this product in the Sjoberg patented sliding sash vestibule exhibited in Building No. 3. This glass is a good substitute for polished plate glass at less than half the cost. It is claimed to show a great saving in breakage, and is being used by many railways.

* * *

John A. Roebling's Sons Company, of Trenton, N. J., is showing its soldered rail bonds, armatures, field coils and car cables. The space occupied by the company is at the north end of Building No. 4.

* * *

At a comfortable booth in Building No. 3, The American Instrument Company, of Philadelphia, is exhibiting its line of direct current switch boards and portable instruments; also its line of changeable shunts, and an open case of parts exhibiting the excellence in design and the high class workmanship. James G. Biddle, T. G. Seixas and A. B. Weeks are representing this company, and are highly gratified with the success of the convention and with the pleasant calls they have had from the delegates.

* * *

The only man at the convention who has demonstrated his ability to wear three hats at once is E. A. Dossert, of solderless connector fame. He is giving away hats as souvenirs.

* * *

The Sherwin Williams Company is making a specially attractive and interesting exhibition of insulating materials this year, consisting particularly of car panels showing their perfect method system of car painting and the standard colors used by the various street railway and interurban roads which are always interesting to the practical man.

The problem of renovating old rattan seats, which has caused the hair of many a master car painter to turn gray is claimed to have been entirely solved by this company in its rattan seat enamel.

Electric Railway Review
· DAILY EDITION ·

PUBLISHED BY THE WILSON COMPANY
at Columbus, O., in honor of the Annual Conventions of the American Street and Interurban Railway Association and of its allied associations of Accountants, Engineers, Claim Agents and Manufacturers

COLUMBUS. 83 North Third Street CHICAGO: 1660 Monadnock Block NEW YORK: 150 Nassau Street PITTSBURG: 510 Frick Building
Subscription Price, $1; Foreign, $3; Single Numbers, 10 cents. Application made for entry at Columbus, O., as Second-class matter

VOL. XVI COLUMBUS, O., OCTOBER 20, 1906 No. 10f

Flexibility of the Standard Code.

In addition to basing its rules substantially upon those of the American Railway Association governing steam railroad practice, the committee on "Standard Code of Rules" followed the practice of that association in another respect which cannot fail to be of benefit to the roads putting the rules in force. This consists in making the code itself a rather complete but flexible skeleton which may be taken as the basis for the specific code of rules which may seem to be best adapted to the conditions of the individual road. The rules of the code are therefore made as simple as possible and are compiled with a view to cover general conditions. As a matter of detail the rules are arranged so that when a rule may be found inapplicable to certain conditions it may be omitted while the integrity of the numbering system of the rules is maintained. This is a move toward eventually securing absolute uniformity of rules governing street railroads, as is practically the case upon steam railroads, so that a man who has been operating a car in a city at one extremity of the country may know with equal certainty the import of a rule of the same number if he is called to operate in another section of the country.

Let the Little Ones Help.

It is noticeable that officers and executive committeemen of the American Street Railway Association were almost always been chosen from the officials of the larger companies, and it is proper that such should have been the case because the officials of the large properties have reached those positions because of their ability and force. Under the reorganized association the members of the executive committee other than the officers hold their positions by virtue of being presidents of the affiliated associations, so that representation of the American association members on its executive committee is now confined to the president and three vice presidents only. Hence there is perhaps more reason than ever why these officials should be chosen from the larger railways, especially since under the present arrangement it is the large companies which contribute most heavily to the financial support of the association. Nevertheless, the success of the association depends in no small measure upon its ability to enlist the hearty co-operation of the smaller railroad companies. One of the most important functions of the association is to educate the public, and we believe that it has been demonstrated in other lines of business that in such work to use more numerous if less powerful agents is the most efficacious; thus the political general, while making use of the metropolitan journals, never overlooks the country dailies and weeklies, as they are far more influential in molding public opinion. Also it has been remarked that when legislation affecting governmental finance is before congress the representatives of great banks in large cities have little to say on the question, but the public press is filled with interviews with country bankers. Something of the same line of argument can, we believe, well be applied in connection with the policy of the American association in its efforts to form a healthy public opinion that is not biased against electric railway corporations. There is no demand from the smaller company members for offices in the association because there are so few of these offices and so many eminent men representing the larger companies. In the matter of filling committees, however, the same limitations do not obtain, and here would be an opportunity to afford such representation to small companies. There surely must be able men working in the smaller spheres.

The Standard Code of Rules.

Action such as that reported to the convention on Thursday by the committee on "Standard Code of Rules" must be considered as well taken in every respect. The committee reported that it had deemed it advisable to revise the interurban rules which were submitted to the St. Louis convention so as to conform to the practice of moderate speed interurban service. In addition to this it was also stated that in the revision the rules for high speed service had been made to conform as far as practicble to the rules of the American Railway Association for the operation of trains moved by steam. This must be considered a thoroughly satisfactory action. The American Railway Association is composed of the most competent of the executive officers of the steam railroads of the United States, and the rules as they exist now are the product of many years of very careful consideration and revision in the light of experience. What is more significant is that this action was based upon the requests of all the high speed electric roads which reported to the committee, meaning by high speed roads those which run on their own right of way and whose service naturally partakes very closely of the nature of that performed by steam roads. It is of interest also that such action as this will tend materially to assist in the narrowing of the space which now lies between the fields occupied by the two systems of operation. It is inevitable that this distance must narrow with increasing rapidity as the years pass.

Why Were We Here?

One matter in connection with the Columbus convention has provoked adverse criticism, and that is the attendance at the business meetings of the associations which was not as great as was to be expected from the number of delegates at Columbus. The opening meeting of the American association at which the delegates accredited to the allied associations were also present was remarkable by reason of the large number in attendance. The hall was filled to its capacity. It is to be regretted, however, that at some of the later meetings when the business to be transacted was equally as important as at the opening session, there were comparatively few delegates present. It would seem that some method could be devised to secure the attendance at all meetings, and it has been suggested that the object might be best effected by making a permanent record of railway delegates in attendance at each meeting so that a report of the convention would show whether those who had been sent here on behalf of their companies had proved recreant to the duties imposed upon them as delegates. Of those who failed to attend some of the meetings it may be said that it was not entirely their fault as the programme provided for sessions of three, and on one afternoon four, of the associations at the same time. None the less there were those at the convention who were sadly lacking in diligence. Regarding the Columbus convention in general there has been only one opinion expressed. It is the most successful one in all respects that has ever been held by the street railway association. This is true from the manufacturers' point of view as well as from that of the railway delegates. Never before have there been so many orders for equipment placed as has been the case this week. Devoting an entire week to the convention has given every one greater opportunity to properly inspect the exhibits and has been very much appreciated by all concerned.

Hats off to Columbus.

It is a source of no little satisfaction to the Electric Railway Review to be able to say that the fears and misgivings of many of those who arrived in Columbus on Monday in the firm belief that the conventions would be a failure because of lack of facilities, have been pleasingly dispelled. Columbus has kept her word. She has entertained her guests royally, and done all that any community could do to make the meetings of an association successful and to contribute to the comfort and convenience of the delegates. She has taken care of the crowd with far more satisfaction to the crowd than her most hopeful and optimistic friend had expected. It would be foolish, because untrue, to say that everyone has had just what he wanted in the way of hotel accommodations, but that would be the case wherever the conventions might be held. The two things that have contributed to the happy outcome of the past week in Columbus, are the commodious and admirable facilities which the Ohio State Fair Grounds afforded for housing the exhibits, and the homogeneity and effectiveness of the civic spirit which is the great glory of Columbus. We feel that we are merely voicing the sentiment of the members of all the associations concerned, as well as our own, when we extend to the citizens of Columbus thanks for their treatment of the conventions, together with our congratulations upon the effectiveness of their public spirit.

Instructions Regarding Accidents.

The best method of instructing employes in regard to prevention and the proper handling of accidents was the last subject considered in the Question Box of the Claim Agents' association and was treated at considerable length. One of the points discussed was whether instructions should be given under the direction of the operating department or that of the claim department. We believe that the broadest view to take of this particular question is that expressed by some of the companies answering, which is that it made no difference who gave the instruction so long as it was sufficient and carried out under the direction of a competent man. A comprehensive discussion of proper instructions to give trainmen in this regard was submitted by Mr. F. W. Johnson, claim agent of the Connecticut Railway & Lighting Company. Mr. Johnson gives it as his experience that it requires hard and long continued work to properly instruct new men when entering the service and also to keep them up to the standard afterwards. The amount of information which a new employe has to acquire in a comparatively short time makes it difficult to cover all fields properly. A new man has so much that he absolutely must learn before he can operate his car that as a matter of course full instructions as regards accidents are apt to be postponed. There are many just criticisms as to the ignorance and stupidity of employes when it comes to properly taking care of an accident, but Mr. Johnson believes that the responsibility is not wholly upon the employe. Every man requires a different method of treatment, and in handling the question there is nothing to do but adopt that method which will result in the greatest good for the greatest number. For the last three years the company with which Mr. Johnson is connected made a practice of giving talks on summer accidents to all conductors, motormen and inspectors, the employes being taken in divisions of 50 to 100; the talks given them require from one and one-half to two hours. These talks were designed to lay a solid foundation for the prevention of accidents and the proper handling of them when they occurrred. This year the lectures were put in book form and the books distributed to the men. Then when the men assembled the method of instruction was as follows: The lecturer would read a section from the book, and it was found that fully 95 per cent of the men preferred to read it to themselves as the instructor read it aloud. Then if the matter required further explanation or discussion it would be given by the instructor until the point was thoroughly covered. In instruction of this nature it is not considered that the book alone will suffice, as the best results are to be expected when there is oral as well as written instruction, men being more interested when talked to face to face than when instruction is merely given to them in printed form. While it is considered highly desirable that instruction of this kind be given at least twice a year, yet on a large system where it is difficult for the claim agent to cover the entire territory twice, it is considered more important that the instruction be given in summer because of this being the season of greatest traffic. This regular instruction work is supplemented by bulletins which are posted weekly, the subjects treated in the bulletin being chosen with particular reference to the season or any events that may be expected at that time. A book prepared by Mr. Johnson for use as the text for the lectures on behalf of the claim department is a pamphlet of 40 pages, 5 by 8 inches, entitled "Prevention of Accidents."

THE MANUFACTURERS' ASSOCIATION.

At six o'clock last evening, the exhibition of the American Street and Interurban Railway Manufacturers' Association at the Ohio State Fair Grounds was formally closed. To say that the exhibition was a successful one is merely to repeat what has been stated several times in preceding issues of the Review. The general sentiment among the exhibitors yesterday was that they were abundantly satisfied with results from the expense and labor which they incurred in displaying their wares during this convention The admirable facilities which the buildings at the Fair Grounds afforded for such a display contributed much to this result. Each exhibit got the full benefit of such individuality as it possessed, and the wide aisles, the high roof, and the excellent light made displays which were of themselves very attractive, even more attractive still. The architect and the decorative artist had fine opportunities, which they embraced to the full. The chief element of satisfaction on the part of the exhibitors, however, lay in the fact that the railway men visited the exhibits in large numbers and in a spirit of business and technical inquiry, which, it is unnecessary to say, is precisely the attitude that yields the best results to the manufacturers.

The members of the Manufacturers' association moreover have good grounds for being satisfied with themselves With the closing of the exhibition halls last night, the association had passed through its severest test, as this was the first convention at which the present form of organization in all its completeness was subjected to a practical trial. The administration of the affairs of the association in the past year have been eminently businesslike, energetic and intelligent, and the general result which has given such satisfaction to the individual exhibitors has been reached largely through the painstaking attention to details which the executive officers, have given to every question as it has arisen.

The dignified and important position which the Manufacturers' association now occupies, in its relations with the railway associations is unusual, and it has been attained in large part through the sympathetic attitude of the officers of the American Street and Interurban Railway Association. In other departments of industrial activity, where manufacturers and their customers come in contact, through convention and association work, the manufacturers in most cases are not received in the same spirit as the street railway officials now receive the members of the Manufacturers' association. Unfortunately among many officials of steam railways, an impression prevails that railway conventions at which supply manufacturers make displays, are likely to degenerate into junkets, and to have undue influence on the commercial relations between railway officials and those who purchase equipment and materials. The issue of the reorganization work of the last two years among the national associations in the street and interurban field, affords an example which our friends in the steam railway field might study to great advantage. The best way to free the relations between the supply manufacturers and their customers from any suspicion of taint is to recognize the importance of the railway supply interest, and the intelligence and character of the men engaged in it. The railways, and those who furnish the equipment to the railways, must necessarily work coordinately for the best results in the development of transportation facilities, and it is absurd to suppose that, because one man manufactures and sells, and the other buys and uses, either is too good or too great to associate with the other upon an even footing. The street railway manufacturers are to be congratulated upon the unusual recognition which they have received at the hands of the railway societies and it is of the greatest importance that they should place and keep the administration of the affairs of their association in the hands of men of the highest character, and of those who represent the best element and the largest interests among their members.

ECONOMICAL RATING OF PRIME MOVERS AND GENERATORS.

The financial success of electric plants for power or lighting in these days of close competition often depends in a large measure upon the application of sound engineering to the rating of the engines and generators, when first installed, and to the selection of the proper type of prime mover. For the sake of brevity we may refer to the reciprocating steam engine as an engine, and to the turbine steam engine, as a turbine.

In many plants furnishing a public service such as gas works and electric power and light plants, the question of maintenance and depreciation receive too little attention, and the rates assumed for upkeep and renewal are usually entirely too small. The result is that in a few years the plant is worn out, or has become obsolete and the fund for replacement is not sufficient. The development of electrical machinery in the past 10 years has been so rapid that much of the old equipment has had to be replaced by newer designs and the rate of depreciation orignally assumed for renewals has in most cases been based on a longer life than that actually obtained.

The selection of the proper size of engine and generator which will operate most cheaply for the present and at the same time have a sufficient margin for future growth, is also one which requires the most intelligent analysis.

In the paper presented before the American Street and Interurban Railway Engineering Association, at Columbus, (Electric Railway Review, October 17, 1906, page 741) on "The Relative Economy of Turbines and Engines at Varying Percentage of Rating," by Mr. Walter Goodenough, these two questions of cost of renewals and economic rating are treated in a thoroughly intelligent manner. The paper is therefore worthy of the most careful study not only by mechanical and elecrictal engineers, but by those who are responsible for the financial success of electric properties. On account of the rapid and successful development of the gas engine, it is even now supplanting steam engines and boilers in many new plants and the inevitable effect will be to shorten the term of economical usefulness of the steam engine which may be hereafter installed. For this reason Mr. Goodenough has placed the rate of depreciation of steam engines at 12 per cent, which is higher than that usually assumed heretofore.

For the turbine, which must be classed as the most modern and highly developed type of steam engine, the rate of depreciation is taken by the author at 10 per cent in determining proper fixed charges. In addition to competition, the owners of public utilities are confronted with the damaging effect of agitation for municipal control and other similar disturbances, which compel them to entrench their property with machinery which is strictly up to date, and to operate it at the highest rate of efficiency.

In preparing curves to determine the effect of rating on the cost per kilowatt-hour the author has taken for a 500-kilowatt unit the cost of engine and generator as $45; condensing apparatus, $4; foundation, $3; total, $52 per kilowatt. For the turbine of the same power the cost is taken for turbine and generator, $36; condensing apparatus, $6; foundation, $1; total, $43 per kilowatt, to which add for motor-generator apparatus and switchboard $22 per kilowatt, and for superheaters $4.25, making a grand total of $69.25.

For a 1500 kilowatt unit using a steam engine the following figures are assumed: Engine and generator, $35; condenser, $2.25; foundation, $2.25; total, $39 per kilowatt. For a turbine unit of same capacity, the turbine and generator are taken at $28.00; condenser, $5.00; foundation, $0.50; superheater and piping, $4; total $37.50. With these figures and taking coal at $2 per ton, and evaporation at 7½ pounds of water per pound of coal, the curves prepared by Mr. Goodenough show the engine plant with saturated steam has highest efficiency at 80 to 100 per cent rating and that the cost is 2.7 mills per kilowatt. The turbine using saturated steam has highest efficiency at 110 to 130 per cent, and the cost is virtually the same. With the turbine using steam superheated 150 degrees F., the point of highest efficiency has a wide range, from 110 to 140 per cent of the rating, with a cost of 2.4 mills per kilowatt-hour. Taking fixed charges at 19 per cent for the engine unit and 17 per cent for the turbine unit, the operating cost with combined fuel and fixed charges is as follows for the 500-kilowatt unit: For the engine using saturated steam, maximum efficiency is at 130 per cent of the rating; the cost is 3.7 mills per kilowatt hour. For the turbine using saturated steam, the maximum efficiency is at 145 per cent of the rating, and the cost 3.65 mills per kilowatt-hour. For the turbine using steam at 150 degrees F. superheat, the maximum efficiency is at 145 per cent of the rating, and cost per kilowatt-hour is 3.4 mills. Deducting the cost of motor-generator apparatus and switchboard, $22, from turbine-unit cost, the combined fuel and fixed charges amount to slightly over 3 mills per kilowatt-hour for the turbine plant. The curves shown rise rapidly from the point taken for the foregoing figures, but they retain their characteristic forms for any ordinary increase or decrease for cost of fuel and fixed charges. It may be said that after a plant is once installed, fixed charges do not enter into the economy of operation, and the plant should be run at the rating which shows lowest steam consumption. The author gives the following reasons for including fixed charges when the plant is in operation:

(1) The operating reason, that with the load usually carried by the operating engineer, full value is not being obtained from the investment. A monthly report which shows fixed charges per kilowatt-hour generated should be of immense value to the superintendent in determining whether his plant is receiving the particular and discriminating attention which such a large investment warrants.

(2) The investment reason, that a machine which has the lowest combined cost per kilowatt-hour at the individual loading that is carried, is the most desirable to continue in the installation. Manifestly a machine which has a combined kilowatt-hour cost lowest at 100 per cent rating is better than one having its lowest cost at 140 per cent rating.

Mr. J. P. Provost, treasurer of the General Railway Supply Company, of Pittsburg, Pa., was one of the late arrivals at the convention.

CONVENTIONALITIES

Most appropriate on the part of the American Street and Interurban Railway Association and the allied associations was the token of appreciation which these organizations united in presenting on Wednesday to the retiring president, Hon. W. Caryl Ely. It has been well known for two years or more that it was Mr. Ely's personal desire to withdraw from the sometimes arduous duties devolving upon the chief executive officer of such an association; but at the earnest solicitation of his fellow officials and upon their showing that especially during the period of reorganization the associations needed exactly the qualities of generalship and diplomacy possessed in so marked a degree by Mr. Ely, he finally consented to serve until the present time. Though what Mr. Ely denominated the formative period may not have fully passed, he has seen enough of the work of the officers of the affiliated associations to rest assured that the finishing touches are consigned to competent hands. He retires with the certainty that the work which has had so much of his best effort has been such as to insure a great future to the associations and that the associations appreciate it to the fullest extent.

EN TRIOMPH.

(Bronze by Bofill)

A TOKEN OF APPRECIATION UPON THE RETIREMENT OF
HONORABLE CARYL W. ELY
FROM THE PRESIDENCY OF THE
AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION
FROM THE
AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION
AMERICAN STREET AND INTERURBAN RAILWAY
ACCOUNTANTS' ASSOCIATION
AMERICAN STREET AND INTERURBAN RAILWAY
ENGINEERING ASSOCIATION
AMERICAN STREET AND INTERURBAN RAILWAY
CLAIM AGENTS' ASSOCIATION
OCTOBER 17, 1906

As a token of such appreciation must be considered the beautiful specimen of the sculptor's art which was presented on Wednesday with a fitting verbal tribute from him who is now Mr. Ely's capable successor, Mr. John I. Beggs. The circumstances and the gift were presented fully in the Electric Railway Review of October 18. That statue typifies "Triumph," and triumph is the word that fitly describes the result of its recipient's contest with the difficulties that were involved in the construction of the magnificent organization which exists today. The gift is merely a token; the organization is a monument.

The accompanying engraving inadequately represents the statue and its pedestal; the inscription which is also reproduced indicates the universality of the sentiment which prompted its presentation.

A party of Boston delegates accompanied Mr. E. C. Spring, president of the Central Electric Railway Association, in his private car "Overlook" from Columbus to Dayton yesterday afternoon. The Bostonians to leav Dayton for the east terday afternoon. The Bostonians expected to leave Dayton for the east last night.

Many of the visiting railway officials have displayed a lively interest in the workings of the seven-tickets for a quarter plan in operation on the local street railway. Several of them were heard the other day questioning a conductor about it and asking, "How can they make it pay?" The general opinion seemed to be that paring anything off the nickels is cutting pretty close to the danger line.

Mr. H. U. Powers, of the Gould Storage Battery Company, New York, has been in attendance at the conventions demonstrating the merits of the Gould battery for telephone, police and fire-alarm work, his position being that of manager of those departments for the company.

Mr. W. W. Power, familiarly known as "Bill," has been kept busy explaining to the delegates why he left his last love, the National Brake & Electric Company, "to go with a handsomer gal." Mr. Power is now district manager for Allis-Chalmers Company, at Philadelphia, and says he is proud of the fact.

Vaudeville Entertainment.

The vaudeville entertainment of the Manufacturers' association at the Great Southern Opera House last night was a proper closing for the greatest convention ever held by the electric railway men. Aside from the regular programme an impromptu sketch was staged with Mr. Charles C. Peirce and Mr. H. C. Pirrung alternately taking the parts of comic, serio-comic and serious parts. This part of the entertainment was introduced by Mr. Peirce, who after speaking briefly upon the courtesies extended to the delegates and guests to the convention, called Mr. Pirrung to the stage and in a few well chosen words presented him with a beautiful badge as a token of the association's appreciation of the untiring work Mr. Pirrung has done toward making the convention a success. On the badge was appropriately inscribed one of Mr. Pirrung's most pleasing sayings, "Don't worry, my boy, just leave it to me."

After the presentation Mr. Pirrung replied in his jovial, genial way reviewing the work of Mr. Peirce and his recommittee and ended by stating that he would accept the badge only as a custodian for the people of Columbus, as each and every one of them had aided in making it possible to have those attending the convention properly cared for.

The regular programme was opened by the "Third Rail Glee Club," which was composed of twenty-three men who, under the direction of Mr. Karl Koenig, rendered several pleasing songs. The opening song was a solo by Mr. Henry Frillman. The club responded to several encores.

Mr. A. L. Havens, through the courtesy of the Ohio Brass Company, consumed about ten minutes in mysterious legdermain. Mr. Peter Small, representing the Acme Automatic Street Indicating Company, executed a solo on the violin that was pleasing. Mr. R. M. Campbell, who was styled the king of the black face comedians—with apologies to Lew Dockstader—told some alleged witty anecdotes and made a hit. Mr. John H. Thomas, through the courtesy of the Standard Paint Company, sang several songs and Mr. Thomas H. Bibber gave some clever impersonations. Mrs. William Nowland Amory presented, in monologue, "Behind the Curtain." This sketch was furnished by Mr. Jacob Wendell, Jr., of Wendell & McDuffie. The Colonial Steel Company presented through Mr. Clarence E. Billings an original reuben from Maine that made one of the hits of the evening. A commedictta, "A Game of Cards," as played by Messrs. Evert Jensen Wendell, Francis M. Verdi and Walker Marcus Dennett and Miss Ella Denison preceded the grand finale by the Columbus Serenaders.

Au Revoir.

Oft on these closing days,
With empty booths around me,
Fond Memory comes and stays
And recollections hound me.

When I remember all
The stirring scenes now gone—
When Memory's tabs recall
The things we've seen and done—

When I recall again
The times we've had together,
I'm like a rooster in the fall
Exposed to stormy weather—

I feel like one that treads alone
Some barnyard all deserted;
Whose corn is fed, whose hens are dead,
And all for market started.

THE RELATION OF STATISTICAL BUREAU TO THE CLAIM AGENT'S WORK.*

BY W. DE MATTOS HOOPER, PRESIDENT, THE HOOPER-HOLMES INFORMATION BUREAU, NEW YORK CITY.

While this topic is sufficiently broad to permit of the discussion of various kinds of statistical work which might be of value to the claim department, this paper will deal only with the subject of the gathering of records, and the exchange of information between the companies relating to personal injury claims. It is, of course, a well recognized fact that within the past few years there has been a marked increase in the number of fraudulent, questionable and excessive claims made against railroad companies, and the question of how best to resist and defeat claims of this character is one of the most important and vexatious problems which confront the managements of public service corporations. The eneormous losses thus sustained necessitate the adoption of such protective measures as will tend to reduce and minimize these losses. The increasing activity of the ambulance chaser and the fraudulent claim worker and their confederates has made it necessary for the officials of the claim and legal departments of these companies to investigate most carefully and searchingly many of the claims presented, and we believe that no one familiar with the subject will dispute the statement that it is of the utmost importance for the companies to make it a practice to inquire thoroughly into the antecedent accident history of their personal injury claimants. Assuming, therefore, the necessity of such investigation, the question arises as to what means may best be adopted in conducting these inquiries in such a way that prompt and full information may be had regarding any other claims for damages which the parties may have made on account of the same or previous alleged injuries.

Most of the larger transportation companies, realizing how important this branch of their work is, now have large and well equipped claim departments comprising a staff of attorneys, claim agents, adjusters and investigators. They are thus able to investigate all claims immediately upon their presentation, and, in the majority of cases, promptly to get at the facts and circumstances attending the alleged accident. If, however, to the efficient service thus rendered by those who personally handle these cases, the companies could be placed in a position, through an exchange of records with other companies, to immediately obtain information regarding any other claims which might have been made by their claimants, this would facilitate materially the handling of these cases, and, in some instances, make it possible for the company to complete its investigations much more quickly, and to effect salvages which otherwise could not be made. If the claimant has collected damages from another company for the same or some other alleged injury, it is most important that the interested company should secure this information as promptly as possible, in order that it may obtain full particulars regarding such other claim, or claims, and learn what disposition of it was effected.

If, therefore, there could be organized and put into effectual operation a system whereby companies which have to deal with personal injury claims, could promptly exchange information with one another regarding their claimants, this would unquestionably prove a most valuable aid to the claim departments. The quesiton naturally arises as to how such a bureau could be organized and operated to yield the best results. If the work were confined to an exchange of information between the street railways only, its value would necessarily be limited, as it would not have the records of claims made against steam roads or against the accident insurance companies. The same objection applies to a bureau operated exclusively by the steam roads, or by the casualty companies. To make such an exchange of the greatest practical value, all corporations which have to deal with personal injury claims, particularly all casualty and transportation companies, should co-operate in one bureau, thus making available for the use of each company the claim records of those corporations throughout the country against which the great bulk of these claims is made. An exchange which includes records of claims against accident insurance companies, steam railroads, street railways and other public service corporations would be far more effective than one limited to a certain class of members; the broader its scope, the greater the practical benefits to the companies participating.

In this connection, there should be considered also the question of the relative value to the claim department of the records of other transportation companies as compared with those of claims against the casualty insurance companies. Experience shows (as hereafter explained) that the carrier companies would derive greater assistance from the reports of the latter than from those of other railroad companies.

This is true largely because of the fact that claimants against the transportation companies are frequently at the same time claimants against accident insurance companies, while the records obtainable from the claim department of other roads would necessarily relate exclusively to prior alleged injuries. Furthermore, only a small percentage of the records of other roads would be of any value because of the fact, that, outside of the large cities, they would relate almost entirely to non-residents, only a few of whom might subsequently sustain injuries on the lines of another road. Thus, for example, the street railway company operating in the city of Columbus, O., would very infrequently have to deal with a claimant who had previously sustained an injury on the lines of the street railway system of Worcester, Mass., and vice versa.

In the case of a person presenting claims to a transportation company and an accident company for the same alleged injury, co-operation between them would be in many cases of the utmost value to each. It is a well known fact that a large percentage of the personal injury claims against the roads are for excessive amounts. In a case of this kind, where injuries were actually received, but the damages claimed were excessive, the record of a simultaneous claim made against an insurance company might conclusively establish the fact that the claim against the road was extortionate, and thus materially assist the latter in effecting a satisfactory settlement.

In many of these cases the records of the casualty companies would prove invaluable. The latter, under their contracts, require immediate notice of injury. This must be followed by the statement of the claimant, usually under oath, together with a statement from the attending physician, as to the nature of the alleged injury and the period of disability. Statements from witnesses, as a rule, are also required. In addition to this, a physical examination is generally made by the company's surgeon, the company at the same time investigating the various facts and circumstances of the alleged accident. In this way, within a short time after the original notice of disability is received the casualty company has in its possession a complete record of the claim. Frequently, however, claim is not made against a railroad company until some time has elapsed after the alleged accident, and it is thus often difficult and in some instances impracticable for the company to obtain any definite information regarding the case. Through such an exchange as this, however, it could immediately learn of the claim made against the insurance company and, by communicating with the latter, obtain copies of affidavits and other proofs of claim and of the report of the company's surgeon, etc., and thus at once be put in possession of a complete history and record of the case.

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*Presented before the American Street & Interurban Railway Claim Agents' Association, Columbus, O., October 16, 1906.

In other ways the co-operation of the casualty companies would be of great assistance. A railroad company frequently considers it important that a physical examination of the claimant should be made, but is unable to secure it, owing to the refusal of the claimant. In contracts of accident insurance it is expressly provided that such examination may be made at any time by the insurance company. Hence, in such a case, if the claimant should also have a claim pending at the same time an accident company, the latter, ostensibly for itself, could make an examination at the request, and for the benefit, of the railroad company. For the past few years the casualty companies throughout the United States and Canada have been carrying on an exchange of information of this character. The work is handled in the city of New York by a bureau known as The Hooper-Holmes Information Bureau. Until about three years ago, the exchange was exclusively between the accident insurance companies. At that time, however, the managers of the bureau, realizing how valuable the records would be to the railroad companies, extended the service to the claim and legal departments of the latter, and a considerable number of the roads are now actively participating as subscribers. Most of the latter are steam roads, the subject having been first taken up with them through the American Association of Railway Claim Agents at its convention at Niagara Falls, in 1903. For some time before then, this association had been considering the advisability of organizing an exchange of this kind among its own members. When, however, the nature and scope of the work which was being carried on by the accident companies was explained to them, the members of the association realized that far better results could be had by affiliating with the bureau of the insurance companies, rather than by undertaking to organize one of their own which would be limited to the exchange of records of claims against the steam roads. Experience has shown the wisdom of their decision. Within a stated period "duplicates" (i. e. cases where two or more subscribers were interested in the same party on account of either simultaneous or previous claims) were found in 26 cases between two or more railroads, and in 828 cases between railroad and casualty companies, out of a total of 854 duplicates.

At a recent convention at Cincinnati, in May 1906, of the American Association of Railway Claim Agents, the subject of the bureau service for the transportation companies was officially discussed at considerable length, and was most strongly endorsed; and on that occasion, because of the close relations that had been established between the Bureau and the members of the association, the managers, Messrs. Hooper and Holmes were elected honorary members of the association. It is now the purpose of the management to take up the matter actively with the claim department officials of the street railway companies, with a view to securing their participation in the work, and we are glad to avail ourselves of this opportunity, extended to us through the courtesy of your officials, to present the subject to the members of your association.

When we first had under consideration the question of extending the service to the railroad companies, one of those from whom we sought advice was Dr. J. B. Lewis, medical director and adjuster of the Travelers Insurance Company of Hartford Conn., who, as many of you know, has had a long and extensive experience as an adjuster of personal injury claims. In giving his opinion, Dr. Lewis wrote as follows:

"When we commenced writing liability insurance, all the claims and many of the other features of establishing a new business came under my personal care and management. We did a large street railway business, and wrote also several steam railways. The principal express companies were also protected by our policies. It did not take me long to find out that we were doing an exceedingly hazardous business, but as most of our contracts were written for five years we set to work and made close investigation of the nature of the risks we were carrying. You may say we should have done that before we took the risks, but there was an element of hazard in it that we could not possibly have found out. We knew, of course, what each of the companies, especially the railways, were paying annually for personal accident claims, but there was no way of determining the cost to be incurred through fraudulent claims. It very soon developed that there were individual swindlers, and later an organized gang of scoundrels who were planning and executing fake claims, and the expense growing out of this class of claims was more disastrous than the legitimate cases. I saw enough of this business to satisfy me that if the railways—both the steam and the street railways—would arrange for an interchange of information touching their experience with fraudulent and other claims, it would be of great value to them, and I soon realized that many of these frauds were mulcting both the railroad and the accident insurance companies, and that the information which the railroad companies would thus gather would ultimately be of value to the insurance companies, and vice versa. I believe too, that the swindlers would soon learn of it, if such a system of reporting were entered upon, and the result would soon be that they would let those roads alone which were reporting to a bureau. Such rogues are watchful of what is going on, and it is astonishing how soon they find out what is being done to defeat them. Already the life insurance companies that report to our bureau, which is organized in part for a similar purpose, are reaping great advantages therefrom and the speculators in that line of fraud seek a non-bureau company in preference. I believe that your bureau with its voluminous records of personal accident claims, the growth of years, could handle such an exchange with great benefit to the transportation companies, for the reason that you could furnish them with past accident history of claimants of which you are in possession, as well as information of any claims being made simultaneously by the same party against both the transportaion and the accident companies for the same alleged injury. Such an interchange between the accident insurance and the transportation companies would be of great value to each, and much more valuable than an interchange of the same information between the two classes of companies separately. I know from experience with your bureau that a single item received from it may save the subscriber the cost many times over."

At the present time, the bureau has in its files over a million records of personal injury claims contributed chiefly within the past six years. These reports cover the entire United States and are immediately available for the information of subscribers, being fully as valuable for a company in San Francisco or New Orleans as for one in Chicago, or New York. They are now increasing at the rate of about 170,000 a year.

The system on which this bureau operates is as follows: Each subscribing company mails to the bureau daily, or as claims are presented, on blanks furnished by the bureau, reports of its personal injury claims, the full name and address of the claimant being given, and also, if possible, the age and occupation, for the purpose of identification. The rendition of these reports involves but a small amount of clerical work on the part of the individual subscriber. On receipt of every such report the records of the bureau are carefully examined to determine whether the party has previously been reported by any other company, either for the same or a previous injury. If not, a record of the claim is simply filed away in its alphabetical place for future reference; but if the records show one or more other reports on the person, each of the subscibers which reported him is at once notified of his full record, and they can thus immediately communicate with one another and exchange information concerning such claimant. In the handling of these reports each subscriber is designated by a number instead of by name, and all reports are treated as absolutely confidential.

In assisting the claim departments in these cases, the bureau accords a protective service against fictitious and excessive claims which might be termed a form of insurance against the latter. Many cases, of course, might be reported by a subscriber in which no records would be found in the bureau files. On the other hand, in connection with the very first claim reported information might thus be obtained which would mean the saving to the company of thousands of dollars. This has been the experience of a number of our subscribers among the railroad companies. By the casualty companies, the service is regarded as an indispensable adjunct to their claim departments. There can be no reason why participation in the work should not be as valuable to the street railway companies as to the steam roads and the accident insurance companies. They deal with the same class of cases; their interests in this respect are identical. Every safeguard should be adopted which will tend to protect them against these fraudulent and excessive claims. By active co-operation with the other companies through the medium of this bureau, their investigations would frequently be greatly facilitated, valuable information secured which otherwise might not be obtained, and material assistance rendered in the settlement and litigation of their claims. Under these conditions, we feel assured that the members of your association will be interested in considering individually the question of affiliating with the bureau, and thus securing for their companies the substantial protection afforded by its records.

Borne, Scrymser Company, caters to high grade lines of traction lubrication. Where turbines are used, attention is called to its brand of Turboil and in cases where the installations for power generation are represented by high duty gas engines, gas cylinder oil is specified to meet such requirements, the company only asking to know the type of the gas used in each case. Polar air motor oil is recommended for the lubrication of air motors used in connection with traction air-brake systems. Borne, Scrymser Company, No. 135 Front street, New York, is the address from which further information may be obtained.

AMERICAN ASSOCIATION, FRIDAY SESSION.

The vice-president, Mr. John I. Beggs, called the meeting to order at 10:30 a. m., in executive session.

The report of the committee on Municipal Ownership was presented by Mr. C. D. Wyman, chairman. The report of the committee on Public Relations, was presented by Mr. Henry A. Robinson of New York. Mr. Beggs, as chairman of the committee on Compensation for Carrying U. S. Mail made a report.

The paper on "Handling Public Complaints," by Mr. John A. Beeler, vice-president and general manager, Denver City Tramway Company, was read by the secretary. On motion the paper was received and ordered to be spread on the minutes. The paper on "Leaks between Passenger and Treasurer,"by Mr. A. H Stanley, general superintendent, Public Service Corporation of New Jersey, was read by Mr. Stanley. On motion the paper was received and ordered to be spread on the minutes; and permission was subsequently given for the publication of these papers.

John I. Beggs, President-elect.
American Street and Interurban Railway Association.

Mr. W. G. Ross, of Montreal, stated that in his opinion, the important part of the electric railway business which relates to fare collections is the most unsystematic part.. Continuing he said: "If anything is wrong with the trucks or rails or power houses, it is put right. Many have the opinion that the method of collecting fares on cars is wrong, and it is time it was put right. Mr. Stanley makes mention of our 'pay as you enter' car which we are operating in Montreal. We brought one of these cars with us to show you on the spot. This car gets over all leakages. There is no question about that. We have been troubled in Montreal only in one direction, that of the conductors missing fares. We are not troubled with dishonest conductors. We use the fare box. This car is in successful operation. We have 50 cars running today, and will have 100 more during the next four months. This car is also a great preventive of accidents on the rear platform. I think that accidents happening on the rear platform are the most troublesome ones, for the reason that the conductor is generally in the front of his car collecting fares when these accidents happen and it leaves the company open for some unscrupulous person to make absurd claims against the company.

"The other matter to which I referred is that of the daily car record. We do not have this in Montreal, because we do not use the register, but it seems to me that you are making bookkeepers out of the conductors in the use of this record, taking up their time on the car attending to this when they should be attending to other duties. Our "pay as you enter" car does away with the accounting between the conductor and the company. The advantages to the public in the use of this car is that once the passengers get inside of the car there is no further trouble; they have two separate exits and they can leave the car without any interruption by the incoming passengers. We do not have a conductor going through the car every time a passenger boards it. I think that is quite a point in favor of the car, especially during the time when the cars are very crowded, when you frequently have the conductor moving through the car pushing against the passengers, which is very objectionable. This car keeps the conductor where he ought to be, on the rear platform, to look after his business. The car is here for your inspection, and if you come to Montreal you will see it in actual operation."

On the suggestion of Mr. Beggs, Mr. C. D. Wyman moved a vote of thanks to the Montreal Street Railway Company for its action in sending a "pay as you enter" car to Columbus for inspection (Motion carried.) When question as to what method was pursued in issuing transfers to the passengers as they got on such cars. Mr. Ross stated that the conductor issued the transfers at the time the passenger entered the car.

Mr. Beggs asked would not that have a tendency to choke the entrance of the car and delay the car very greatly, when the conductor is busy delivering a large number of transfers to different points to the passengers. In Milwaukee the issuance of transfers had been a matter that had received a great deal of attention and a good deal of criticism. Nearly all the roads in the different parts of the country have found it necessary, he believed, in order to reduce the abuse of transfers, to require them to be demanded immediately upon the payment of fares, and in Milwaukee, unless they are so demanded, the transfer is not issued. His company had made the regulation that transfers must be called for at the time of the payment of fare. It seemed to him that a mass of people crowding on the car, among whom might be some of the rougher element, that they would crowd onto the car and block up the passage way.

Mr. McDonald, of Montreal, replied that the platform was sufficiently large to accommodate about 40 passengers, although they might be a little crowded. He thought that in exceptional cases, the maximum cases, 35 or 40 will be the limit of any picking up at any transfer corner. He said:

"The 'pay as you enter' car is not a pay before you enter car. The rear platform of the car, is very large and has been made the pay office of the car. When there are 35 or 40 passengers to deal with, the pay office is sufficient to accommodate them, and whilst these 35 or 40 persons are getting on, there will be at least 10 or 15 that will already have passed through and squared their accounts and there will probably remain 25 or 30 that must be attended to. The conductors carry four different kinds of tickets, and must furnish tickets of each of the series to passengers who request them and issue transfers at the same time; but the issuing of transfers and the giving of change and tickets is done while the car is under way, those who have still to be attended to remaining on the platform. The practical operation is to get the passengers into the pay office and then start up and collect the fars, and before the car reaches the next corner that 35 or 40 persons will have paid their fare, and also the satisfaction of knowing that the company has received its proper dues.

"So far, we have been groping around our cars and instructing our conductors to search for their fares. The conductors oftentimes do this in a searching, suspicion-looking manner which is very disagreeable to our patrons. The "pay-as-you-enter" car is conductive to the safety of the passengers. By putting the conductor at the post where he can have control of his car, accidents are avoided and satisfaction is given to those who have a right to expect it. The conductor also is benefited by the new arrangement."

The nominating committee submitted the following ticket which was unanimously elected, the secretary being instructed to cast the ballot of the association:

President, John I. Beggs, Milwaukee, Wis.

First Vice-President, Calvin G. Goodrich, Mineappolis, Minn.

Second Vice-President, James F. Shaw, Boston, Mass.

Third Vice-President, Arthur W. Bradv, Anderson, Ind.

The members of the executive committee in addition to the officers are:

C. L. S. Tingley, Philadelphia, president of the Accountants' association.

H. H. Adams, Baltimore, president of the Engineering Association.

S. L. Rhoades, Philadelphia, president of the Claim Agents' association.

Vice-President Beggs announced the result of the election and said:

I desire, gentlemen, to express my appreciation of your action in elevating me to this very responsible and somewhat onerous position. I shall, to the best of my ability, perform the duties devolving upon me, as president of the association, and give the office such time as it may require. I earnestly ask your co-operation, your sympathy and your assistance. We are dependent very greatly upon the members of the association for its success, and particularly upon those who have had experience in years gone by. There are many things still to do to render this association as effective as we hope to make it. One of the things which I think we should all bend our energies to is to increase the membership, and we ask you in the various sections of the country as you come in contact with those who are connected with companies which are not now members, to exert your best effort to secure such companies as members of the association. The offices of the association will bend their energies to bring in some of the large companies in the east before the next annual convention.

We should also devise some method of improving the attendance at the open sessions of the association, after the opening session. We have had before us this morning some of the most important matters that could come before the association, and yet there has only been a very small percentage of those present who should be here. I feel that when a company sends representatives here, these representatives owe it, not only to this association, but they owe it to the companies they represent, to attend the business sessions. Another year I shall suggest to the executive committee that we have a roll prepared at each meeting which will show who are in attendance and send a copy of that roll to every member of the association that they may know whether those whom they have sent to the convention have performed the duty which they owe to the companies and to the association. I do not think that there has been a session of this association when there has not been some business transacted knowledge of which would be of advantage were the delegates to carry it back to their companies. My belief is that we would get a better attendance and cut into our time less, if we had one session, say from ten to one o'clock or two o'clock, as might be determined and have our convention called to order promptly. That would leave both ends of the day open for the inspection of the exhibits and other matters. It is discouraging for the presiding officer to look on a mere handful. We have over two hundred members, and I know there are many representatives of these companies in these buildings at the present time, and I do not think they are performing the duty which they owe to this organization; and if they do not owe the duty to this organization, they owe it to the company that sends them here. I again thank you, gentlemen. I appreciate the honor and I know the work that is incumbent upon it. The work exceeds the honor, great as that is, because no man can perform the duties of the office without a great deal of time being given to them, and a great deal of work, particularly following after a president who has held this position for three years. I think it will be easier for my successor to follow after me than it is for me to follow after Mr. Ely.

On motion the president and executive committee were authorized to revise, add to, or take from the various standing and special committees, or to create new committees.

Resolutions expressing the thanks of the association for the various entertainments provided for its members were unanimously adopted, also resolutions thanking the retiring officers and authors of papers.

Mr. Ernest Gonzenbach said he wished to speak on behalf of the smaller companies, and in line with what President Beggs has just said in regard to the interests in the work of association. He represented a small company and had taken pains to talk with a number of managers who are operating properties not very much larger than his own road, and sometimes smaller. He found there seemed to be a feeling that the smaller companies are not properly recognized. He believed the interest of the association will be advanced if some method is made to get the co-operation of the men who manage the small properties with a revenue below two hundred thousand dollars per annum. Many of the men connected with these companies had shown marked ability, and they should be encouraged to exert themseleves in the work of this association. What the smaller companies needed is encouragement and not patronizing.

President Beggs said that this matter was within the power of the companies themselves. It was not so often a question of should be advanced to these positions, but who had shown sufficient interest to warrant the association in putting them in official positions. If the men representing the smaller companies would attend the meetings and take an active interest in the proceedings they would have no cause to think that they were not receiving a proper amount of consideration. To a great extent it had been the men charged with the responsibility of administering the larger properties in the country who had given that time and attention to the work of the association, and that was why they were so often selected. He believed that if the representatives of the smaller companies would take a more active interest in the matters which come up on the floor of the convention, which they were urged to do, they would have no reason to feel that they are not properly considered in the selection of men to do the work of the association. There was, to his knowledge, no attempt to patronize these small companies.

President Beggs said he would announce one member of one committee in advance, he intended to make Mr. Gonzenbach chairman of a committee to select gentlemen to prepare papers for the next meeting.

Mr. Gonzenbach said he did not know whether this appointment was an honor or a punishment, but in either case he would be happy to take it up.

On motion of Mr. A. H. Stanley it was voted to appoint a committee to consider the question of adopting a standard symbol to indicate the stopping places for cars.

Adjourned.

SOME NOTES ON THE EVOLUTION OF ELECTRIC TRANSPORTATION.*

BY THEODORE STEBBINS, EXPERT NATIONAL CIVIC FEDERATION, COHASSET, MASS.

The relation of transportation to civilization may be likened to the blood circulation within the body. Improved circulation nourishes the body. Improved transportation advances civilization. The life of civilization depends on transportation. Therefore, this association, organized to promote transportation facilities in certain fields, is a highly important agent of civilization.

Upon the organization of our parent association in 1882 its personnel consisted of companies operating cars in city streets with horses or mules as the motive power and the meetings of the association were devoted mainly to a discussion of the feeding, shoeing, stabling and driving of these animals. Before the close of that decade, a few venturesome companies tried electric motors, partly for expected economy, partly for humanitarian reasons. Those early electric equipments were crude. Some cars had a motor on the front platform, some had motors of only 7½ horse power. New motor design followed new motor design again and again. It is not my intention to describe the events of this blood and money struggle by inventors, engineers, managers and capitalists for the next few years. Those early years are life memories.

Allow me to remark, outside the scope of this paper, that these frequent replacements of equipment created, in some instances, so-called "watered stock," that is, stock not represented eventually by physical property value, which stock has a legitimate birth and existence if we recognize the value to the city and whole country of this repeatedly and highly forced traction-service development.

What is the measure of our increased service to the public within these twenty years of progress?

A comparison of the conditions at present and ten or fifteen years ago, reveals, in a remarkable degree, the benefits conferred upon the ordinary passenger by the introduction of the electric railway. For the payment of the same nickel we can travel, say, four times as far and can ride, say, three times as fast on cars, say, twice as large and far more elegantly furnished. The cars run more often, say, three times as often, and are far better lighted and heated. Through the introduction of new lines, rolling stock has been increased during the twelve years beginning with 1890 from 32,000 to 60,000 cars, and now includes in the neighborhood of 80,000 cars. During the same fifteen years the passengers carried on the street railways of the country have increased from a little over 2,000,000,000 to considerably over 6,000,000,000. As a fair estimate of the increase of the population of the country during this time would be only 25 per cent, the difference between 35 per cent and 200 per cent, combined with the better service already described, expresses the measure of the benefits to the public of these improved facilities.

Completely absorbed, as most of us are, in all-compelling daily routine duties, I mention these facts that we may not forget how vital our traction service is to the community, to what splendid developments we can point in the last twenty years and to add that equal possibilities lie with the future.

Last year this association was reorganized. Now we recognize and include "interurban railways." This enlargement of the scope of our activities is of great significance, an evidence of the virility of our organization; of its extending usefulness in the application of electric traction to wider transportation needs. The highest development of these interurban railways has been reached as yet only within a certain limited section of our country and within such a recent time that many are not familiar with the scope of their usefulness and their demonstrated necessity in the economy of the community. This development has created, within five years, an extended network of service in Ohio, Indiana and adjoining states. The network in this section already connects 3,600 miles of track, exclusive of city lines, and probably over 5,000 miles, inclusive of city lines. And even now the steam railroad world seems to have become inoculated thoroughly with "electric traction."

Looking at the chronology of electric traction, some assign the year 1886 as the birth of urban electric railways; 1896 as the birth of interurban railways and 1906 as the birth of electrified steam railroads. Look next at the benefit to the community. As applied to city railways, electricity supplies a hitherto unused motive power and magnifies the economic value of the service. As applied to interurban railways, electricity supplies a new and previously unconceived public service, affording high speed hourly transportation at low fares for persons and property between country and city and between cities. As applied to steam railroads, what will be the result? How will it affect their methods of operation, speed, frequency of transportation, rates of fare, volume of travel? What will be the relation between "interurban" and "railroad?"

This seems a time of special appropriateness to record some distinction in construction and operation of electric traction in these various applications.

Therefore, I present in detail the following notes: For brevity I have used the terms "City Railway," "Interurban" and "Railroad," meaning, respectively, typical city electric railway, interurban railway and steam railroad. In making various statements it must be understood, without qualifying, that I speak of ordinary typical and high class practice and not the exceptional which special conditions may justify or demand. My subject matter is classified as Right of Way, Track, Station, Power Transmission, Rolling Stock, Passenger Traffic, Freight Traffic and the Future.

Right of Way.

The railroad owns its right of way in perpetuity, ordinarily free of restrictions of construction, service or speed.

The city railway occupies public streets under a franchise limited in term and with obligations relating often to track, paving, sprinkling, speed, service and fares. Often a manager, making a life study of how best to serve every interest concerned, is much embarrassed by the ideas of inexperienced municipal communities. The limited-term franchise defeats its intended purpose. It repels capital seeking a permanent investment at low interest rate. It encourages speculative management at the expense of the physical property and its service. How much wiser to give the railway perpetual "location," as it is called in Massachusetts, subject to the regulation of an experienced state board with a broad-minded and settled policy.

The interurban has, in the country, its private right of way, and in each city traversed either its own franchise or running rights over city track. Its operation, as a whole, is dependent upon franchises—often numerous ones. In some few cases the franchises have been procured only by agreeing with one city to specify rates of fare over a track running many miles without the city. Some lawyers hold that cities cannot prescribe conditions of operation without their municipal limits and that county authorities can prescribe methods of construction affecting traffic on the highway, but not methods of operation, schedules or fares.

In some cases interurbans, while entering cities and traversing towns, could secure private right of way for some part of the distance, avoid street accidents, and, above all, shorten schedule time and really diminish ultimate capital outlay, since track construction costs only half on private way what it does in a paved street and can be maintained so much cheaper.

Track.

In its construction, the track of the best interurban roads is identical with that of the high grade steam railroads, except, ordinarily, the interurban rail is seventy pounds and the railroad rail is one hundred pounds to the yard. In both cases the prominent features are good drainage, abundant crushed stone or gravel and low grades. As to curves, interurban practice should differ from railroad practice. The single track interurban, with its vastly more frequent train service at higher speed, and, with less experienced employes, should provide special safeguards at curves not affording a free view across the curve of approaching cars, and if a free view is impossible, should double-track the curve, which is an absolute prevention of head-on collisions, or set slow signs. Often a trifling sum spent in removing trees and bushes will give substantial protection against collisions.

From experience already accumulated, the average interurbans are progressing constantly toward the highest railroad practice in track construction (excepting in weight of rail), and the best interurbans have reached it already.

The city railway track in paved street differs radically from either of the others, with a 100-pound girder rail, different drainage, sharp curves and shallow special work. The heavy interurban car depreciates such track rapidly unless it is of a high standard of heavy construction. Interurban cars are often handicapped on city railway tracks by light construction, shallow special work, by the city railway cars, municipal restrictions on speed and other features and would be exceedingly fortunate could they reach the business center of the city by traversing less mileage of suburban street and securing a portion of private way. To illustrate, in one case an interurban makes 75 miles in 3 hours, of which one hour is taken in only 10 miles of city street.

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*Read before the American Street and Interurban Railway Association, Columbus, Ohio, October 18, 1906.

These standards are the final evolution from horse car service of 35-pound rails, light joints and little or no ballast.

Stations.

The pioneer power plants contained usually a few 80-horsepower dynamos, simple non-condensing engines, tubular boilers; in contrast, a modern plant may contain 8,000-horsepower generating units and condensing high-pressure steam plant. Direct current was then transmitted a few miles only at 500 volts; alternating current may now be transmitted very many miles at 40,000 volts. The salient features for a modern model plant are abundant land (for extension), good soil or rock foundations, the greatest abundance of condensing water, the most convenient delivery and storage of fuel and economical machinery simply arranged.

As between city railway, interurban and railroad service, the stations do not vary in type, but only in capacity and kind of current generated. For short transmission 600-volt direct current is generated. For longer transmission in the larger city railways and all interurbans and all railroads, alternating current is generated at 10,000 to 40,000 volts.

Power Transmission.

The conductor on which the car makes its electrical contact is located over, under or alongside the car, and known, respectively, as trolley, conduit or third rail. The overhead trolley has had a remarkable career. Practically unchanged, except a little heavier, during twenty years of evolution, it has witnessed repeated and radical changes in every other part of the equipment. Electric traction was made possible and has grown to immense proportions by virtue of the overhead trolley. It encircles the world.

But for heavy traction by direct current and on private way, the third rail, with its conductor of iron and small erection cost, is cheapest and best, but it should be protected from sleet. The managers, studying every comfort for high-speed, long-distance travel, should consider it pleasanter to passengers to avoid the overhead construction, with noisy overhead trolley and poles flickering by the view.

The conduit is unnecessary and objectionable for railroads and interurbans and too expensive for the ordinary consideration of city railways.

The overhead trolley will continue a necessity for city railways on public streets, for most interurbans also, because they traverse so many public streets of the cities, towns and villages served, and, perhaps, also for railroads, if high voltage must be delivered to the car.

From station to substation, high voltage lines carry the current, and these, when well constructed, give practically no trouble, except from lightning, falling tree-limbs and malicious youths. The damage from lightning has been diminished by improved insulators, but the interruptions still occur. A high tension line following the track, beside a public highway, passes old homesteads and underneath fine old trees, which the owners cherish and will not part with. Malicious youths will aim at insulators with bullet and stone, but usually only at some favorite loitering spot.

Rolling Stock.

While the construction of track, stations and current distributing systems are matters largely for the broadly experienced engineer to decide, the selection of rolling stock involves more conditions and has such a potent influence on the financial results of the whole enterprise that it should command the combined wisdom of all concerned. So many elements are involved that it is difficult to observe an orderly selection in mentioning them. Some elements involved are headway necessary to properly encourage travel, speed always limited by safety, and in city railways by number of stops and on railroads by power cost, volume of average travel, fixing car seating capacity and excursion travel fixing number of extra cars, weight determined from seating capacity and speed, number of motors per car fixed by cleanliness of rail, usually one to each axle for city streets, or unusual acceleration or one to four axles or less for locomotives, and loaded cars attached on clean rail with moderate grade acceleration, not to mention numerous other elements. The limits of ordinary practice lie between cars varying in over-all length from 20 to 70 feet, in seating capacity from 14 to 70, in weight, empty, from 8 to 55 tons, in maximum speed from 15 to 65 miles and in motor power from 30 to 500 horse-power.

The increase of car speed induces travel, increases receipts, reduces every expense except accidents and power bill. Higher speed requires stronger cars for protection in accidents, but the heavy cars increase the power bills much faster than they reduce the car maintenance expenses. Some interurbans have eight pounds of dead car weight to one pound of paying weight and could operate lighter cars with better net economic results.

Passenger Travel.

Let us consider interurban passenger travel compared with that on city railways and steam railroads. It partakes of conditions in both and occupies an intermediate ground. There are the interurban 5-cent riders to and from terminal cities and not always profitable. To stop a heavy, high-speed interurban car costs too much in loss of time and power to leave a satisfactory profit out of a nickel. Some interurbans have adopted a minimum fare of 10 cents. There are the through passengers possibly paying 75 cents each. Three of them may be more profitable than a crowded car of 5-centers. Through travel deserves every encouragement. Such passengers are often secured in competition with the steam railroads and every convenience and comfort must be afforded them. A trip of a number of hours duration on an interurban may be decidedly tiresome unless roadbed is smooth, trucks easy, seats comfortable and stops infrequent. The serving of local and through passengers reaches a happy solution if the volume of travel will support an independent service for each. Some few interurbans operate cars with superior furnishings, chair seats and the like, with stops only at the more important towns ten or twenty miles apart and may charge an extra fare in compensation, either for the higher speed or the better car furnishings or the more exclusive accommodations. In estimating the profitableness of this special service, it should be realized that a number of the passengers would otherwise have taken the local cars.

On the city railway one pays a fixed price per trip, independent of the distance traveled and the collection of fares is relatively simple. Some interurbans have attempted to fix fares on the city railway basis, not realizing that heavier cars, higher speeds, less frequent headway and fewer passengers, more nearly approximate railroad conditions. Interurban fares are commonly calculated on a per mile basis. Tickets are sold in great variety. Using the word "local" to mean good only on the line of the selling road and the word "interline" to mean good on one or more connecting lines, I specify: Local one-way card tickets, local round-trip card tickets, local mileage books, local commuter (or monthly) books, half-fare one-way and round-trip tickets, school tickets, local excursion tickets, interline one-way and round-trip tickets, interline (or interchangeable) mileage. These tickets may run into enormous number and kind. On one system I found on sale 400 different kinds of card tickets. The gradations of rates for these different classes of tickets depend on local conditions and ideas of the management—to illustrate one case, I fixed approximately on the following standards—one-way adult ticket, 2 cents per mile; round-trip, adult, 1.8 cents; children, age five years to twelve years, one-half the preceding; mileage books, 1 2/3 cents; commuter books (50 rides, within 30 days, one individual), 1.5 cents; school children, 1.2 cents, and for excursion rates I will say 50 cents per car per mile, measuring both ways, not in one direction. Excursion rates vary enormously per car-mile and the conditions that determine them are complex. Interurbans commonly maintain full fares on summer Sundays and holidays and carry full loads, while some western steam railroads run Sunday excursions at a third to a fifth of regular rates. On week days the interurban with a park is justified in making carload rates that may figure low, say, one-half cent per passenger per mile. The city railway, with the enormous patronage which a 5-cent fare may attract, can afford to spend large sums on a park, against which the interurban, with a park ten or fifteen miles out of the city cannot draw nightly any considerable casual patronage at a fare of 25 cents or more, unless the park has natural attractions. The interurban competes sharply with the railroad on conventions. Its chances are better on small conventions, say, under 200, than on large conventions, say, over 600. Its chances are better on a one-day convention under fifty miles than on a more prolonged and more distant convention.

Speaking of general travel, many interurbans will secure more through passengers when they can give better connections and better handling of baggage. Through travel is especially profitable to interurbans and should be cultivated in every way. The all-impelling motive for the through passenger in the majority of cases is this: The interurban charges, say ¾ cent less per mile than the steam line. On a 200-mile trip this amounts to $1.50. Say the steam line takes five hours and the interurban eight hours. But the interurban runs hourly, can be reached more conveniently and leaves one nearer destination. Now most people give up the day to such a trip and the saving of a few hours means nothing. Retaining $1.50 in pocket is a tangible thing, meaning much. Besides, interurban travel is more pleasant than steam travel, especially in summer.

Freight Traffic.

Let us also consider interurban freight traffic compared with that on steam railroads. The steam railroads live on their freight business; it affords double the revenue of passenger; they handle the business by wholesale; have enormously powerful and efficient locomotives, most extensive terminals and a most comprehensive organization within and between their companies. The interurban may earn one-tenth its revenue from freight. The interurban's freight business is bound to increase a number of fold. It suffers limitations, however from inadequacy of terminal facilities, from the frequency of passenger service on a high-speed single track interurban line, from the objections to ordinary freight cars traversing city streets, and from the rules of railroad freight associations against exchanging cars except between their own members. In some cases this rule is not observed, but generally it operates. Few interurbans do any material amount of carload lot business. Rates do not differ materially, and there is a large and growing business coming to the interurbans of a most miscellaneous character, of which much is secured through quickness of delivery.

Some interurbans do an express business only. The difference between "freight" and "express" is not quite clear. There is a clear distinction in the rate sheet, but not in the service performed. A full express service includes wagon call and delivery. In one case I compared an express business with wagon service and express rates on one interurban with a freight business, no wagon service, and freight rates on another interurban. After deducting cost of wagon service, the earnings in each case were the same, *i. e.*, nearly 30 cents per car-mile. To do a profitable freight or express business on an interurban requires a judicious discrimination in the class of business sought.

The Future.

The superior convenience of electricity gives it no visible successor for city railway service. The convenience of electricity has operated powerfully to create the interurban business. Did steam railroads operate a passenger service only, I doubt not that electricity would quickly be adopted. For railroad freight service the enormous investment required for electric traction is the obstacle in the way. Other motive powers deserve watching. The gasolene motor is making enormous headway in automobile service, but several railroad cars which I have seen so equipped do not fill the bill. They require engineers rather than motormen. The gas turbine may solve the railroad problems, but this device has not got beyond the magazine columns.

In conclusion, it was my intention before commencing this paper to give a mass of statistical information, but without much explanation it is often misunderstood, so I have simply made this notation of facts, familiar to many in the interurban business, but which I hope may afford some food for contemplation to others.

Upon entering the main entrance to the exhibition halls the first booth to be seen is that of the Cheatham Electric Switching Device Company of Louisville, Ky. This company's exhibit affords a practical demonstration of the working of its switching devices as used on electric railways in 40 of the leading cities of the United States. The company is represented here by R. V. Cheatham and S. C. Brandon.

* * *

The Foster superheater, made by the Power Specialty Company, of New York, can be installed in any of the standard types of boilers or in an independent setting. All pressure parts are constructed of steel. All parts exposed to gases are cast iron, the cast iron covering being in the form of heavy corrugated rings which store and prevent sudden fluctuations in the superheat and also obviate flooding devices. The elements have an inner tube forcing all the steam to come into direct contact with the active heating surface. All parts are readily inspected. This company makes the Harter joint for taking up the expansion in steam piping; the Duval Metallic Packing; and the Kent Wing Wall furnace for smoke prevention. It also makes the Rife hydraulic ram and will soon put on the market some of these rams of very high capacity.

HANDLING PUBLIC COMPLAINTS.

To deal with the traveling public without developing undue friction is one of the most perplexing problems which daily confront of a street railway manager. Many a complain of trivial nature could easily have been forestalled and the patron satisfied had the employe concerned exercised a little diplomacy in dealing with him. While many conductors and motormen often exhibit this faculty to a remarkable degree, others seem utterly devoid of any power to enforce the company's rules without giving offense, and it is against the latter class that nearly all the complaints are made. A man who has no tact cannot get along with passengers, and such a man is sadly misplaced when he attempts to act as a conductor.

Many and varied are the complaints and grievances. Some of them are sublimely ridiculous, while others are weird, a few highly dramatic, and occasionally we hear one which even borders on the tragic.

In cases where complaint is made that the correct change was not received we find that the plan of filing papers pertaining to each employe in a separate folder, which will be described hereafter, is a particularly advantageous one. If a conductor is using the 'short change" method for gain, such fact, if not otherwise detected, will soon become evident from the numerous protests of passengers that will accumulate in his file. There is no doubt but that tricks of this nature have been perpetrated to some extent in every city. Conductors have been known to openly boast that they took advantage of a certain class of passengers whose sight was poor, who were slightly under the influence of liquor, or whose attention was otherwise taken up. Unprincipled conductors have also been known to carry a supply of Mexican coins, and to work them off when giving change to this same class of patrons.

In Denver all complaints, unless manifestly absurd, are carefully investigated by the management. When a written complaint is received, it is at once acknowledged by a courteous note stating that the matter will be thoroughly investigated. The standing of the person who makes complaint or the evidene of sincerity with which it is written is taken into consideration. The writer is thanked for calling the company's attention to the matter, and if the information contained seems insufficient, further information along indicated lines is requested. We find that persons making written complaint usually have had some just provocation, for by the time one complaining has got home or arrived at his office and penned a note, he has generally cooled off to an extent sufficient to either give a clear account of the trouble, or entirely ignore it and not make a complaint. Very little attention is paid to anonymous complains.

A printed form for cmplaints made in the office has been in use by some street railway companies. It is known as a "Complaint Card." One side of the blank is devoted solely to the statement of the complainant, who is required to write it over his signature. The other side is reserved for the division superintendent or special investigator, who writes thereon the result of his investigation and his recommendations; and below this there is also a space for the judgment and final action of the superintendent. While this method seems very concise and complete, we find that while many persons who wish to register complaints have rehearsed the incident or accident so fully in their own minds that they can relate all the harrowing details if subjected to a little judicious questioning, yet, in their excitement, when they undertake to write their statement, seem to think they have conveyed all the particulars in a few disjointed sentences. Some persons have the ability to express themselves on paper, while others have not. From our experience we believe that the best plan is to have the complainant make his report to a competent stenographer, who is well enough posted to make proper inquiries and draw out information which may be needed to make it complete. The complainant may be required to sign the typewritten record, if thought necessary or advisable. In this manner we may render material aid to those who are required to make the investigation.

After passing out of the stenographer's hands the complaint is laid before the superintendent of transportation, who will, unless immediate action becomes necessary, refer it in turn to the division superintendent. It may be found more prudent to withhold the complaint from the employe against whom it is registered, and require him to write the details of the alleged occurrence from his own viewpoint, giving also the names of any witnesses that may have been secured on the car. After gathering all the information possible, the division superintendent returns to the superintendent of transportation the statement of the employes, together with all the papers in the case, and also adds his findings and recommendations. If names of any witnesses have been furnished by the employe or complainant, the superintendent of transportation will communicate with them, unless he has already fixed the blame. At the completion of his inquiries, he issues such orders for discipline as his judgment may dictate. No matter what other action may have been taken in cases of complaint wherein employes have been found at fault, the details are briefly written in their records, together with the final disposition of the matter.

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*Abstract of a paper read before the American Street and Railway Association, Columbus, O., October 19, 1906.

For filing complaints we use the ordinary vertical cabinet file, with folders of light cardboard, similar to those used for correspondence. The folders are numbered to correspond with the numbers of employes' badges, so that it becomes a simple matter, when reviewing a man's record, to open the cabinet and take out the folder containing the complaints and other papers bearing on his past conduct. Should it become necessary to call an employe into the office for discipline, the superintendent may, in a few moments, examine his record card and folder, and quickly form his judgment as to such employe's future value to the company.

Briefly our aim has been, as far as possible, not to antagonize the public in any manner, but to rectify all mistakes and make an apology for all incivilities on the part of our employes; to correct such tendencies, especially those of impudence and impertinence, to pour oil on the troubled waters, and adopt Denver's motto of "Smile and Push" for the company.

THE ACCOUNTING OF CAPITAL EXPENDITURES.*

BY P. S. YOUNG, COMPTROLLER PUBLIC SERVICE CORPORATION OF NEW JERSEY.

It is hardly necessary, in a paper to be read before this association, to differentiate between "Capital Expenditures" and "Non-Capital Expenditures," for the term "Capital Expenditures" is well defined and understood by accountants generally. It is here used to cover such expenditures as are properly chargeable to capital in the accounts of an operating street and interurban railway.

The accounting of this class of expenditures is important, both from a financial and an engineering point of view. A company carrying on work of any magnitude must at all times be prepared to meet its obligations incurred either in the regular operation of its properties or by reason of extensions, additions and improvements made necessary because of the growth of the territory in which it operates, or because of the strategic importance of the territory through which it wishes to extend. It is, therefore, essential that a proper record be kept, not alone of such obligations and liabilities as would naturally appear on the company's books, but also of such commitments as have been made by the undertaking of specific work in connection with the development of the property.

________ Street Railway Co.

No.________

REQUISITION FOR IMPROVEMENTS OR REPAIRS.

No. 208

________ 190

Explanations:

ESTIMATED COST.

Material—To be ordered:

On Hand:

Labor—

's Bid

's Bid

's Bid

Total Estimated Cost

Remarks:

________ General Supt.

Date of Previous Repairs, if any,

Cost " " " $

Received

________ 190

Recommended

Amount for Approval, $________

Charge ________

________ Acct.

Close into ________

________ Acct.

By ________

Gen'l Auditor.

Date________

Approved by

Executive Committee.

________ Sec'y

Date ________ 190

Received ________

Auth. No.________ Date________

Written by________ Date________

Entered in Record Book by

____

Date ________

Figure 2.

Such actual requirements as are necessary for the betterment of the property during a certain period should be summarized from detailed estimates of costs, and should be treated upon their approval as incurred obligations. The importance of reliable estimates is here apparent for on these estimates the financing of the company is based, and if, on the other hand, an estimate is made that is too high and proves more than sufficient to do the work contemplated, an unnecessary expense is incurred in obtaining funds to meet the estimated requirements; on the other hand, if the estimate is too low the management may be misled into doing work which, if it had known the true cost it would not have done.

________ Street Railway Co.

AUTHORIZATION OF IMPROVEMENTS OR REPAIRS.

Req. No.________ Date________ Authorization No. ________

Subject________

Date________

Gen. Supt.

Dear Sir:

Your Requisition of the above number has been received and the expenditure you recommend is approved by the Executive Committee. You are hereby authorized to proceed with the work as follows:

ESTIMATED COST.

AMOUNT AUTHORIZED

Work to be charged to account________

This account to be closed into________ ________ Account.

COMPARE THIS AUTHORIZATION WITH YOUR REQUISITION ________

Figure 1.

It is important that estimates should cover the work in its entirety. They should not embrace work which, upon its completion, would compel other engagements before being advantageous or profitable to the company.

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* Read before the American Street and Interurban Railway Accountants' Association, Columbus, O., October 16, 1906.

For the information of the management and for the purpose of accounting, each separate estimate should give in detail the items which go to make up the complete cost of the work. Upon its authorization by the management a number should be given to it and a separate account kept of the cost in such detail that each item can be readily separated and kept distinct from the others. Experience soon develops definite units of cost which will enable the engineer or officer investigating the costs to determine intelligently whether the work is being carried on with proper economy. Such units of cost are readily assimilated by the working force, ease with which comparisons can be made with similar units and exert a beneficial result on their energies because of the of cost of work that is being done simultaneously, or of work that has been done at a previous time.

____________________ Street Railway Co.

Requisition No. ________ Date ________ Authorization No. ________ Date ________

REPORT OF IMPROVEMENTS OR REPAIRS.

____________________ 190

Completed ____________________

Work on above Authorization completed, as follows:

Description—

Cost

Material—

Labor—

's Bid.

Work was charged to ____________ account. Total Cost,

To be closed into ____________ " Amount Authorized.

Remarks:

____
General Supt.

Authorization closed into

____________________ account.

By Journal Entry

Ledger Account, $

Cost as per Report, $

____
Gen Auditor

Entered Record Book by ______ Date ______

Noted

Initials	Dates

Figure 3.

Req'n No.	Date.			Requisition		Authorization				
	Of Req'n.	Rec'd	Passed to Works Com.	Subject	Explanation	No.	Date Approved by			Amount
							Com	Com.	Com.	

Figure 4.

Only when full detail costs are kept and made to agree with the total cost of a given piece of work can detail costs be relied upon as embracing all the charges against a given account, for it is a frequent occurrence that when estimates are made up from memoranda only of similar work in the past made by the man in charge of the work, such estimates are likely to be faulty, as important items of the total cost are easily overlooked.

Authorization					Report							Remarks
					Date			Actual Cost				
Construction	Operating	Miscellaneous	Date Written up	Date Passed to Dept.	Of Rep't	Rec'd	Com. of Work	Amount	Construction	Operating	Miscellaneous	

Figure 5.

The accounting of "Capital Expenditures" is also important from an engineering point of view. The unreliability of estimates has often caused a company to contract for its construction work even when there is on hand an engineering department fully competent to do the work, such unreliability being due, not so much to lack of engineering talent as to insufficient or inaccurate data of cost upon which the estimates have been based. There does not seem to be much question as to the advisability of a company doing its own construction work, where such work is fairly constant, instead of contracting for same, and the advantages of having a skilled engineering force to carry on such work will appeal to everyone who has had experience with both methods.

The treatment on the books of the company of an estimate after it has been approved and an authorization number given, requires little explanation. The material for the work, when purchased, should be passed through a storeroom or stock account and only charged to the job or authorization when used. It is desirable that this be done rather than that the material should be charged direct to the authorization when purchased, both because it remains under the control of the stock clerk and can be properly cared for, and because a smaller stock of material can be carried when this material remains available for any work that may be in process. Then, too, by such treatment of material purchased, the amount charged to an authorization at any one time more nearly represents the condition of the work.

When the authorization is completed a report should be made of the cost in detail, with the costs per unit figured out for comparison purposes. It is advantageous, if the job is a large one and covers more than one month's work, that from month to month unit costs be arrived at and reported on, preliminary to the final report. Each authorization can be carried on the books of the company in a sub-ledger, and on the general ledger the amount charged can be carried under the proper construction of equipment account.

Intelligent accounting should be the means of control of the efficiency of the working force and should guide the management in its operation of the property. Such control and guidance is just as beneficial in operations that are chargeable against capital as those that are charged against income. In the latter case it has come to be recognized as a fundamental principle that a thorough analysis and comparison of operating expenses or costs is necessary for economical and efficient operation, and when it is remembered that, to keep up with the needs and demands of the communities which they serve, it is frequently necessary for public service companies to make an annual capital outlay equal to 25 per cent to 50 per cent of their operating disbursements, the importance of a comprehensive and analytical system of accounting of capital expenditure is readily apparent.

Appendix.

The accompanying forms illustrate the author's ideas as to how improvements and repairs may be promptly taken care of by the accounting department of a street or interurban railway company.

QUESTION BOX OF THE AMERICAN STREET & INTERURBAN RAILWAY CLAIM AGENTS ASSOCIATION.*

1. Is it good policy to settle personal injury claims in which there is, according to the investigation, no liability, when it can be done along close lines, or shall we stand on these cases and settle only those which are close or for which we are clearly liable?

The opinion is quite generally expressed that it is good policy to settle claims where death or serious personal injury has resulted even though there is no liability on the part of the company, provided this can be done along close lines such as the allowance of actual funeral expense or actual expense for surgeon and hospital charges. This, however, should only be done where the settlement of such cases is in a perfectly friendly way, is appreciated and it is sure that one is making friends by so doing. The benefits will come indirectly from the parties themselves or their friends by the good feeling that is brought about by such settlement. The conditions of each case will very largely govern its handling.

2. What steps are taken, and by whom, to collect damages for injury to cars on the street by vehicles, etc., owing to neglect or recklessness of drivers, or the breaking of glass by persons outside or inside of cars through no fault of the company?

The general opinion was that no set rule can be laid down for the collection of damages from owners of vehicles running into and damaging cars. It is thought to be good policy to ask a settlement but not to demand it.

3. What is the law in your particular State in a case where a pedestrian or teamster is struck by a car while crossing the tracks; who testifies that he looked and listened and failed to see the car; where the conditions are such that he could not help seeing it if he had looked, and where it would be self-evident from the surrounding circumstances that the man was committing perjury. Could he be convicted of perjury in your state if the jury find for the defendant in a damage case?

In the answers submitted the general thought was expressed that conviction for perjury with a railway company as prosecutor is almost impossible, though the question had been tested in only a few states. The mere failure to recover would not be sufficient grounds to secure a conviction.

4. What is the best way to break up ambulance chasing?

There are two alternatives suggested—either settle with the claimant personally or, if his case has no merits, fight it out in the courts.

5. What is the custom or practice in regard to calling upon injured persons especially when there is no liability?

The majority of the companies seem to favor the practice of calling on injured parties, where there is no liability, only when the injury is of a serious nature. The practices of the various companies varies widely and no set rule can be followed. The action taken is usually governed entirely by the conditions under which the injury occurred, though several companies make it a point to call on every person injured.

6. How can conductors and motormen be made to render reports of accidents seemingly trivial?

The answers show that the most general method favored is severe disciplining for failures to submit a report.

7. What qualifications should a claim agent possess to be successful?

The answers to this question embody all the qualifications of the most keen, clean-cut man imaginable. Some of the qualifications suggested are good judgment, acute discernment, resuorcefulness, honesty, diplomacy, sympahty and knowledge of the laws.

8. Is it advisable to declare your identity to possible claimants in every accident which occurs, or not? If so, why? If not, why?

The general opinion is that on this point honesty is the best policy. As to whether a claim agent should declare his identity at once on opening an interview the circumstances should govern.

9. Is it advisable or good policy to obtain medical examinations in all cases of injuries, and how soon after the accident?

If the accident were at all serious, the answer would indicate that a physician should make an immediate examination, but in the case of minor accidents it is suggested by some that presence of a physician might tend to aggravate the sense of injury on the part of the claimant. Whenever examination is to be made the physician should be called at once.

10. What is the best method to adopt in the investigation and disposition of "blind or unreported cases"?

It is hard to lay down any rule for handling such cases. They call for the best efforts of the claim department. The claimant should be visited and all possible details obtained from him as well as from his witnesses. Learn from the car records the crew at the location of the accident and question the men thoroughly. The character of the claimant and his witnesses should be investigated. Study of the particular neighborhood where the accident occurred and the questioning of those habitually found near there might disclose useful facts. These are good cases to settle for a very small amount, and likewise good cases to go to a jury, for it cannot help seeing that there was some reason why the company was not notified in the first place, instead of a lawyer, and nine times out of ten it will bring in a small verdict.

11. What is the best method of settling claims; by cash, check, or order on the treasurer?

The use of cash is favored for small settlements because some claimants are favorably impressed by the display. With the signing of proper releases the use of cash seems safe, but some prefer, especially when paying attorneys and agents, to use checks that require endorsement.

12. Is it a good plan to discuss case matters with attorneys after a case has been placed in their hands?

The general opinion seems to be that after a claim once has been placed in a reputable attorney's charge the company's interest often may be helped by discussing the case with him if in doing so it is not necessary for the claim agent to disclose his defense.

13. What is the best plan to adopt when prominent physicians, who are inclined to be friendly, present bills for double the amount charged in ordinary cases?

If the value of the friendship of the physician is not rated too highly the bill should be contested, otherwise it should be protested without offending and paid in full if necessary.

14. Is it better to interview an injured person before the investigation is made in order to get his or her statement first

The majority believe that it is wise to interview the injured person before the investigation is made. This interview furnishes a basis on which to interview others.

15. Should a surface railway company have a regularly employed physician?

It is the general opinion that any but the smallest companies should have regular physicians. It is the opinion of some that the physician should not be a salaried official, but be retained for definite charges in each case.

16. Does sending a physician in minor cases aggravate the case and make it more difficult for settlement and more expensive?

The general opinion is that the sending of a physician to visit minor cases is to the advantage of the company, as he can often gain valuable information.

17. Which is the better qualified, the operating, or claim department, for instructing trainmen in their duty in relation to accidents?

The answers do not definitely decide this question one way or the other. They indicate that conductors and motormen should be instructed by the operating department in relation to accidents, but the claim department should heartily co-operate with the operating department and bring to its attention anything pertaining to a claim or decision deciding a new point, which would enable the operating department to keep its men properly instructed.

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*Presented before the American Street & Interurban Railway Claim Agents' Association, Columbus, O., October 16, 1906.

18. What is the best form of blank release to be used in settlement of cases, to safeguard it against future attacks?

It is quite generally conceded that any release form should be carefully worded under legal guidance and even then some errors may develop. One answer included the following form, said to have "stood the test of the Supreme Court in every particular."

Birmingham Railway, Light & Power Company.

To.................................Dr.,

Address.................................

Know all men by these presents, That for, and in consideration of the sum of .... dollars, to ...... paid by the Birmingham Railway, Light & Power Company, the receipt whereof is hereby acknowledged .... the undersigned .... do hereby release and forever discharge the said Birmingham Railway, Light & Power Company from any claim, demand, or liability for payment of any further or other sum or sums of money for, and on account of growing out of the following mentioned matter and claim, viz

For ....

... .

... .

... .

And in the consideration of the payment of said sum of $...... to the above-named payee, evidenced by ...... signature to the receipt hereto below annexed, I, ... do hereby promise and agree that said payment and receipt shall and will operate as a full and complete release, discharge, and satisfaction of any, every and all cause or causes of action, claims, and demands against the said Birmingham Railway, Light & Power Company arising or growing out of the cause or matter above set forth, and also as a perpetual bar to any warrant, suit, or other process of proceeding for the collection or legal enforcement thereof, or to any claim or demand for damages under and by reason of the provisions of any statutory enactment whatsoever, or at common law, or otherwise, for the results, or in consequence of the said personal injury to .... the said ...., which may have been or may be asserted or instituted. And this agreement shall further operate and be in full discharge, satisfaction, compromise, settlement and bar of any claim, discharge, warrant, remedy, suit or proceeding which may have been instituted by me and be pending before any court or tribunal against said company, or of any judgment, order, or decree which may heretofore have been entered or obtained in my favor against said company, for any sum arising or growing out of the claim or demand set forth above. It being hereby expressly declared to be the intention of this instrument to forever release said Birmingham Railway, Light & Power Company from any and all other claims, demands, or rights of action of every nature, originating prior to this date, because of any like cause or causes of complaint. And it being hereby expressly understood and agreed that the above named company is not under any obligations or requirement to take or retain me in its employment or service in any position or capacity whatever.

Given under ...... hand and seal, this .... day of ...... 190..

Witness: ....

Witness: ....(Seal)

Approved

....(Seal)

Claim Attorney.

Approved:

General Manager.

19. What statistics relating to accidents should a claim department have, and of what value are they?

It is generally thought that complete records of accidents, including their causes, nature, results, together with data regarding all claims and their settlement, should be filed in an accessible way. They are valuable in increasing the efficiency of the claim department.

20. Of what value are photographs in the disposition of claims?

The general opinion is that photographs are valuable to the claim agent if taken properly, directly after an accident. Their high value in the trial cases is illustrated in some answers.

21. What is the best way to maintain harmonious relations between the claim and operating departments?

The heads of the two departments should keep in close touch with each other.

22. What has been your experience in following up so-called permanently injured persons after their claims have been disposed of? Wouldn't it pay to keep them under observation?

Few such cases are followed, except where damages paid have been excessive. It is doubtful whether or not it would pay to keep track of such claimants after they have been paid and signed a release.

23. What is the best plan in securing full details and protecting company's interests in accidents resulting in death?

Immediate action should be taken to secure, in a useful form, all possible information relating to the scene and details of the accident, deceased and his family, together with all possible statements by crews and witnesses.

24. What instruction should be given conductors and motormen regarding accidents when they first enter service? In what manner should instruction be given?

Platform men should be taught the causes and results of accidents and how to avoid them. The best way to do this is by incorporating the desired rules in the standard rule book, and supplementing the use of this book by talks on the subject.

LEAKS BETWEEN PASSENGER AND TREASURER.*

BY ALBERT H. STANLEY, GENERAL SUPERINTENDENT PUBLIC SERVICE CORPORATION OF NEW JERSEY.

No other phase of street railroading has been given so much thought and attention as the question how to get a proper fare from every passenger and then into the hands of the treasurer. From the earliest days every operating man has tried to conceive a scheme whereby this result might be accomplished, but so far without material success. That electric railroads are not receiving their just revenue, and that some method must eventually be devised whereby the large and rapidly growing deficit can be controlled, there can be no possible doubt; and that it must be along lines providing for entirely different methods than are now generally in vogue on most roads must also be admitted. That this is recognized is evident from the frequent experiments which are being made from time to time calling for a new type of car, or some radical change in the method of collecting fares. Today we have the "pay-as-you-enter" car, which is perhaps the most radical step toward an attempt to solve this problem that has ever been introduced. To what extent this car will prove successful only a thorough trial on several large American roads will demonstrate. Another device which has long passed the experimental stage where it is now used, and which, while primarily intended as a safeguard against certain classes of accidents, still by relieving the conductor of considerable responsibility gives him more time to devote to the collection of fares, is the rear gate or door, controlled either mechanically or automatically by the motorman. These devices are radical and would no doubt cause some confusion when first introduced, but if they, or any other device, will accomplish even in part a curtailment of uncollected or non-receivable revenue, they are at least worthy of consideration. But while the inventive genius is at work planning some device to solve this problem, we must deal with present conditions of equipment and operation, and do that which will bring the largest earnings, for, no matter how practical any scheme may be which requires a change in the equipment, it will necessarily follow that a long period must elapse before it is in general use, especially on the large properties.

The important revenue leaks on electric railroads today are: Fares not collected, either because of overcrowded cars, carelessness of the conductor, or through the successful attempts of passengers to deceive the conductor and avoid paying fare; the abuse of transfers; and fares collected but not properly accounted. Which of these is most important depends largely upon local conditions. That there is an ever increasing number of the public constantly on the qui vive to beat the railway out of a fare, either by evading payment or through unfair use of the transfer, is unfortunately beyond dispute, though to what extent the earnings are thus affected as compared with the losses through irregularities of employes differs on the various properties. But that this is the most serious phase of the question must be admitted. Irregularities on the part of the employes are amenable to discipline, but when it comes to dealing with the public the big stick is sadly lacking. To entirely eliminate abuses by the public cannot be expected, but they can be reduced to a minimum by good service, a continual careful check on the transfers, and the prosecution of any passenger caught defrauding the company. Good service is paramount. Where the service is reasonably good you will find the most satisfactory earnings and the most amicable relations betwen the public and employees. In these days of consolidation there is a tendency toward centralizing the management at one point. While this is desirable, yet it should not be forgotten that street railroads are very susceptible to local conditions, and the organization should be sufficiently flexible so that the management can always be in close touch with the public on all parts of the property. This is equally important in the relations between the management and employes. Where the management is close to the employes, alive to their welfare, and shows that all interests are common, not only will irregularities on the part of the employes be reduced to a minimum, but there will be less trouble with abuses by the public as well.

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*Presented before the American Street & Interurban Railway Association, Columbus, O., October 19, 1906.

To provide a service that is at all times satisfactory is not possible. Cars will become overcrowded despite the most carefully arranged schedule. Conditions which can not be anticipated are constantly arising, and the car, which under normal conditions is well able to handle its portion of the traffic, becomes badly overloaded and disarranges the schedule. (The impunity with which tracks are occupied by drivers, whose total disregard for trolley cars causes delays to the schedule, a hindrance which becomes very serious when wagons break down, is a rapidly growing and quite unnecessary interference with the regular operation of cars and one that railroads should actively combat in their respective communities.) Unexpectedly large crowds at public entertainments, crippled cars, accidents, storms, etc., are all incidents in the operation of electric roads which make perfect headways impossible. But in order to be certain that there are sufficient cars for the traffic under average conditions, a careful record should be kept of the number of passengers carried on each car, especially during the rush hours of the morning and evening. The following chart shows the number of passengers carried on each car from 4:30 to 7:30 p. m. in the direction of the heaviest traffic; it also shows the headway between cars, and indicates at a glance whether the headway is regular and sufficient.

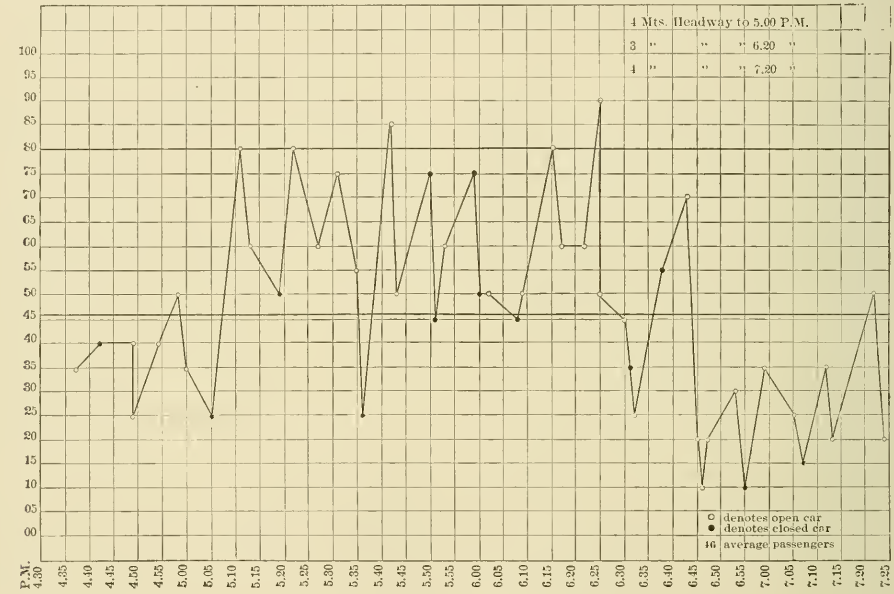

Figure 1—Chart Showing Passenger Record.

The data from which this chart is compiled are taken during the rush hours morning and evening on an average of at least twice a month, and for the entire day at such intervals as may be advisable by men stationed at points where the greatest number of passengers are on the car at one time. The car number, time, and number of passengers on the car (which last has to be estimated, but through practice can be ascertained very accurately) are entered on a blank provided for that purpose, and charted by the same men on the day following. The chart is a printed form, and the load line is based on the type of car in service. The basic figures are: For a 28 to 30-foot closed car, 70; for a 25-foot car, 50; for a single truck car, 40, and for a twelve bench open car, 80. From these charts, with the aid of the man directly in charge of the line, an absolutely satisfactory schedule can be compiled.

During off hours of traffic the question of headway is not so much one of overcrowded cars as of policy. The earnings of most lines depend largely upon the service given. There is hardly any limit to the number of cars which can be profitably operated on a line during the hours of heavy traffic, while during the rest of the day cars operating on a short headway bring the most satisfactory earnings per car day. Today the public is not satisfied with poorly regulated and inefficient service; it must be regular and sufficient, and the public will, in most instances, pay generous tribute in return.

The use and abuse of transfers is of great importance in its relation to gross earnings. The many opportunities which the public have to profit by an improper use of them, the liberal interpretation placed upon their use by many of the courts, the opportunities conductors have, both in issuing and receiving, to neglect instructions in regard to their use and the difficulty of checking them in the accounting department, materially affect the earnings. With from twenty to thirty per cent of the collections on many properties made up of transfers, it forces us to give the matter serious and careful attention, and to take such action as will keep their abuse down to a minimum. The writer's experience recommends a transfer with the date plainly marked on the face so that it can be readily seen by the receiving conductor and in the accounting department. It also greatly facilitates the handling of transfers, and they are not so likely to be manipulated. The waste on this type of transfer is not material, as they can be ordered in quantities to provide for a minimum day's issue, and the excess, if any, taken care of by a perpetual emergency transfer. The transfer with the p. m. coupon attached is also recommended for the same reason. The fear that difficulties might arise through the coupon becoming detached is not borne out in practice.

With this type of transfer the issuing conductor is required to make only two punches, and the receiving conductor can detect at a glance whether or not it is void, which means a big saving in time.

Transfers should be carefully inspected in the accountant's office and conductors brought to account for any irregularities, either in issuing or receiving. In this way conductors will grow careful, and through them the public will be given to understand that transfers are intended for a continuous ride to their destination only and not for a stop-over privilege, and that they are not merely small slips of paper without any value whatever. They should be regarded as having a value equivalent to a cash fare, and ought to be so treated in collecting and accounting. For that reason, as well as because it facilitates inspection, the writer recommends the registration of transfers, preferably on an independent register. Registering all fares on one register offer opportunity for substitution, which is reduced to a minimum by the use of separate registers. The following sketch shows two registers, one for cash fares and the other for tickets and transfers, connected to a rod carried from the center of the car, which obviates the use of a double system of rods, and places the ringing device where it is convenient for the conductor and overcomes the objection so frequently made by passengers about conductors leaning over them when making resigtration or signalling the motorman. This device is particularly desirable on cross-seated cars which are so rapidly becoming a standard on many properties.

NORTH JERSEY ST. RY. CO.
South Orange Ave.
LINE
017316
NOTICE [illegible]
P. M. HOUR

NORTH JERSEY ST. RY. CO. SOUTH ORANGE AVE. LINE
GOOD ONLY, subject to the Rules of the Company, at or before the time punched, and at the place of transfer. The passenger must examine transfer, as same will not be accepted unless properly punched.

If no Coupon attached hour punched is
A. M. HOUR

SAT JUL 21

017316

TRANSFER
PLANK ROAD LINE—E
CHAPEL ST. N
MAGAZINE & FERRY ST.—S, E or W
FERRY ST.—E
HAMBURG PLACE—S
McWHORTER ST.—S
MARKET bT EAST P.R.R.
MULBERRY ST.—N or S
BROAD ST.—N or S
WASHINGTON ST.—N. or S.
MARKET ST.—W.
SPRINGFIELD AVE.—W
NORFOLK ST.—N
JONES ST.—S
BERGEN ST.—N or S
SO. 10th ST.—N or S
MILBURN AVE.—E

12 11 10 9 8 7 6 5 4 3 2 1
15 30 45

Figure 2—Sample Transfer.

Detective registers and register equipment are very important factors in the collection and accounting of fares. The same care which is exercised in the inspection of the electrical equipment of a car should be given to registers and their equipment. Each register should be overhauled periodically, and the inspection of the register equipment made a part of the regular work of the repair men, and any defect in the apparatus should be repaired at once, and no car permitted to operate with the slightest defect in the equipment or register.

A daily record should be kept of the condition of the totalizer of each register in every car, whether the car has been in service or not, and sent to the accounting department daily. For this purpose a daily car record blank is recommended.

A basket is placed in each car for holding these cards, and the depot master or man in charge of the car house equips each car daily with one of the cards, showing the condition of the register before the car goes into service, and each conductor who uses the car during the day makes an entry showing the commencing and closing number of the totalizers, and at night the depot master makes the closing entries which are copied on the card for the following day. These cards are then forwarded to the accountant's office and checked against th conductors' day cards. This record is supplemented by entries made in a daily car record book by the depot master, showing the commencing and closing number of each register, which should be done independently of the car record and is intended as an additional check. Both the car number and the number of the registers should show on these reports.

A recording type of register, particularly on lines having more than one five-cent fare zone, is an effective check against the failure of conductors to reset their registers, and also against manipulation. On suburban lines with many different rates of fare it seems desirable to use a different recording register which indicates the kinds of fare collected and which acts as a check against the tickets issued and collected by the conductor.

The rule requiring conductors to register fares separately as soon as collected and before issuing transfers or making change should be strictly enforced, although it may be advisable to somewhat modify this rule when operating open cars.

Tickets and transfers should be turned in by conductors each trip, either in boxes placed on the car itself, or at some convenient point on the line, in suitably prepared envelopes, and in order that conductors may not carry them over a number of trips they should be inspected at frequent intervals. Cash need not be turned in until the conductor has completed his days' work, and then turned over to a receiver, who should give either a form of receipt or mark in red ink in plain figures on the conductor's day card the amount of money received, so as to avoid any possibility of dispute. It need not mean that the conductor has turned in the correct amount for his day's work, as that is something to be checked in the accountant's office, and if any errors exist, either over or short, the conductor should be promptly notified and full opportunity given him for noting how the errors occurred. Conductor's day cards, and all other reports having to do with the collection and accounting of fares, should be carefully checked in the accountant's office and an explanation required for any erors or neglect in making up accounts. Conductors should be made to

understand the importance of their reports and that they must be made up carefully and accurately.

For the protection of the conductor, each and every passenger riding on the car should be required either to surrender a fare or be uniformed, so that there can be no question as to the passengers' identity and right to ride. Open inspection by uniformed employes, especially at heavy traffic points, is an important factor in preventing irregularities, besides directing the movement of the cars.

Secret service inspection is of course essential to the operation of a property, for under the most careful management there will be some undesirable employes. But a secret service report indicating a shortage on the register does not by any means indicate irregularities on the part of the conductor. Conditions governing at the time the report was made should be thoroughly understood before a record is made against a conductor. He should always be given an opportunity to explain, and should be advised if any entry is made against his record. Dishonesty should be handled quickly and severely. Conductors should be given to understand that irregularities of any kind will not be tolerated, and that the offender will be prosecuted, if possible, by process of law, and not only employes, but the public as well.

The writer does not believe that any considerable percentage of newly appointed conductors enter the service with the thought of being deliberately dishonest. What they develop into, whether it be good or bad, is dependent to a very large extent upon the way they are trained, their relations with their superiors, and the conditions under which they work. Indifferent training, lack of interest, or incompetency on the part of their direct superiors, unsanitary and inadequate terminal stations, or dirty, neglected, broken-down equipment are not conducive to the development of competent, courteous and honest conductors. An applicant should be carefully investigated and every effort made to ascertain whether his record is such as to entitle him to a position of trust. He should then be trained by a regular conductor, who is known to be thoroughly honest and capable in the performance of his duties. After being trained he should be examined by the division superintendent, or whoever may be in authority, and when he is put on a car to operate alone he should be under careful inspection for a reasonable period, so that any irregularities, intentional or otherwise, may be detected in the beginning. Today, properties are becoming so extensive as to make it impossible for a general manager to be personally acquainted with each and every employe, and so it devolves upon the respective division officers to act for him, and upon them to a very great extent depends the amount of revenue which reaches the hands of the treasurer.

THE ELECTRIC RAILWAY AND THE CITY.*

BY HON. HENRY T. BOOTH.

For a session of the American Street and Interurban Railway Association there could be no more appropriate place than Columbus, the birthplace and for many years the home of Prof. Sidney H. Short, one of the most prominent and successful of the pioneer enthusiasts in electric traction, both in this country and in England; the capital of the state in which, at Cleveland in 1884, was installed the first electric street car equipment in America operated regularly for fare; the state whose interurban mileage exceeds that of any other state in the union, and in which the first interurban coupon book was used, and last, but not least, the state which has accomplished more than any other in consolidating its lines into systems reaching across its own territory to connect with lines beyond its boundaries, thereby introducing economies, reducing fares and greatly improving the service, which some politician, disguised as a lawyer, and "scenting the nucleus of a new monopoly" may yet claim to be "contrary to the statutes in such cases made and provided and against the peace and dignity of the State of Ohio."

Development of Street Railway Service.

Although within the recollection of many of you, it seems a far cry from the small, poorly lighted, rarely heated bobtail mule car, moving a few hours each day at irregular intervals and at a snail's pace,—that is, when not being lifted on the track by the passengers,—to the large, well-lighted, well-heated electric cars running in our cities at frequent intervals and at as high a rate of speed as the law permits, and to the trolley parlor car and sleeper speeding over their own right of way from city to city at almost the rate of an express train; and yet one is the legitimate, if not the necessary, development of the other.

Men may live without poetry, music or art,
With a somnolent consciene and an atrophied heart,
They may live without friends, and may live without books;
On a cereal diet they may live without cooks.
But for traffic in cities, on earth or in Mars,
The civilized man must depend upon cars.

For the benefit of New York City and a few other belated communities in this country and many more in Europe, we may paraphrase the last couplet thus:

But an up-to-date system, wherever it be,
Should equip all its lines with electricity.

Reciprocal Benefits.

Without a municipality there could be no street railway. Without a street railway there could be no large and progressive modern city. What was at first only a luxury, then a mere convenience has become one of the prime necessities of urban life. Efficient service at a relatively low cost to the public, on the American plan of one fare regardless of distance, tends to secure a wide distribution of population and to prevent the creation of congested districts, or to mitigate the evils of those already existing, and thus promotes to a larger degree than any other single force, far more than any mere public agency, the cause of sanitation, health and physical well-being.

As no other public utility in urban and suburban life so largely affects the growth, development and general prosperity of a city, or contributes so directly to the convenience, or so effectively promotes the daily economy, the health and the happiness, of its people, even its censors must admit that whoever establishes, promotes or develops such a service, upon terms that are just, is a public benefactor, and is entitled to fair treatment by the public authorities.

Methods of Securing Street Railway Service.

There are various methods by which the public may secure street railway service. Thus far three have been tried—public ownership and operation, public ownership and private operation, and private ownership and operation. All of these have been tried in Europe and to a limited extent in Canada, but only one, the last mentioned, in the United States. If any qualification of this statement be required it arises from the fact that West Seattle, a village in the State of Washington of less than 1500 inhabitants, has been operating a line since February, 1905. But as that village has an area of only one square mile, and as it has but two cars, one of which is operated only an hour and a half each day, during what are called by a recent writer "the rush hours of the evening," West Seattle has scarcely established its standing as an example of municipal ownership, and for the present we may fairly regard it as a negligible quantity in any discussion of that subject.

America the Leader in Street Railway Development.

In the development and improvement of the means of rapid transit North America not only leads the world, but stands in a class by itself. The United States points the way for others to follow. Not only is this true of the development of her magnificent system of commercial railroads, but with reference to her urban, suburban and interurban railways the contrast is even more striking. With only about five per cent of the world's population and six per cent of its land area, we have built and are operating more than sixty per cent of her street railways. Compared with Europe, this country, with a smaller area and about one-fifth the population, has more than twice as large an electric railway mileage. Taken as a whole, the large cities and the small, in point of equipment, speed and general excellence of service, yes, also in rates of fare, measured by average of length of rides and rates of wages paid, our street railway system, developed and improved by American pluck, American intelligence, American enterprise and American private capital and operated on the American plan of "one city one care," with American wages for American men, furnishes the best and cheapest service in the world. And in according this meed of praise, let us not forget the crops of early inventors and promoters who consecrated the best years of their lives to patient, unremitting labor in devising a practical system of electric traction, with the inventor's enthusiasm and the inventor's reward, for

Not a truth has to art or to science been given,
But brains have ached for it, and souls toiled and striven.

Agitation for a Change of Policy.

But what of the future? Is private management to be superseded in America by the policy of public ownership and operation which is now on trial in Europe? Those who favor such a change of policy do not seem to appreciate the fact, that the successful management of such plants requires experience and specialized knowledge of the highest order, or the significance of the fact that the test of fitness for employment in private plants is merit alone. They know that rotation in public office, due to the shifting winds of politics, is the rule and not the exception, and are familiar with the slogan of municipal politics, that to the victor belong the spoils. He who runs may read, so plain the lesson is, that so malign an influence must fatally handicap every municipality in its efforts to secure and retain men of the requisite ability and experience in such departments. In view of past experiencec and of the present agitation, the following axiom should be emblazoned on every city hall in the country: "Until the municipality unites its purse with its patriotism in the management of its public utilities, public waste must always exceed public profit"; and also this: "No traction system can be successfully and economically operated by men who are the mere creatures of a political boss or a party machine."

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*An address delivered at the annual dinner of the American Street and Interurban Railway Association, Columbus, O., October 18, 1906.

So Mr. James Dalrymple, general manager of the Glasgow Tramways, concluded, when, at the invitation of Mayor Dunne, he visited Chicago last year. He came to America an ardent believer in the wisdom of the public ownership and operation of so-called public utilities in this country as well as in his own. So he announced on his arrival. But the epidemic of graft which he discovered was sufficient even for "the converson of the Scot." Let us appeal then from Philip drunk to Philip sober.

In his first interview after landing he said:

"I see no reason why Chicago, or any other city in this country, should not be able to own its street railways, and run them with as much success as we have achieved in Glasgow."

Just before sailing for home he expressed his change of opinion in the following emphatic language:

"To put street railroads, gas works, telephone companies, etc., under municipal ownership would be to create a political machine in every large city that would be simply impregnable. * * * What I have seen here, and I have studied the situation carefully, makes me realize that private ownership under proper conditions is far better for the citizens of American cities."

But for the enterprise of the ubiquitous reporters the testimony of this important star witness might have been suppressed. He was Mayor Dunne's guest. On his way east he conferred with the mayor of Cleveland. These gentlemen are the most distinguished apostles of "municipal trading" in America. But if they had from him any message of hope and encouragement for their followers, it has not been publicly delivered. Truly there are times when silence is "the eloquence of discretion."

Business vs. Politics.

As said by an admirer of the Glasgow system, "It is a government of the taxpayers, for the taxpayers, by the taxpayers. For only taxpayers can vote. * * * Glasgow is a taxpayers' administration." There may be only one Glasgow, but there are many Chicagos of a smaller growth, and no one would be so reckless as to claim that either of them has, or soon will have, "a taxpayers' administration." Indeed there seems to be no hope for any great and lasting improvement in municipal affairs until the great majority of our citizens develop civic pride and a sense of public duty and personal responsibility. The man whose interest in public affairs begins and ends when he pays his contribution into a campaign fund and the politician whose interest begins and ends when he draws his share out are about equally responsible for bad government. Dark as this page of our current history is, there seems to be an awakening of public conscience and a growth of public sentiment which promise better things. But such reforms gather strength slowly because they must deal with the individual, and cannot be accomplished by the mere fiat of legislation. The sponsors of municipal socialism ignore the lessons of the past and seem to have the faculty so rare among men, but said by ungallant bachelors to be so common among women, of actually believing what they know is not true. But are the American people ready, on a most momentous subject, to act upon the theory that the way to confer skill is to administer an oath of office and the way to make a man honest is to tempt him?

Columbus vs. Glasgow.

Naturally the advocates of public ownership and operation look abroad for their illustrations, and point to the tramway system of Glasgow as their piece de resistance. For the reasons just stated it has been honestly and economically managed; but as an argument for municipal operation in this country it is not even persuasive, much less conclusive. Perhaps modesty should forbid me to cite Columbus as a worthy example of private ownership. But as I am somewhat familiar with it, as well as with the Glasgow system, as shown by its official reports and much friendly criticism, I trust you will permit me to institute a brief comparison, without anticipating the toast assigned to another speaker.

Density of population: Glasgow extremely congested; Columbus relatively sparse.

Number of people to be served: Glasgow, urban, about 825,000, including suburbs, 1,050,000; Columbus, urban, 175,000, including suburbs, about 200,000.

Motive power: Electricity, with the overhead trolley, in both.

Area: Glasgow, 19.82 square miles; Columbus, 16¼.

Mileage, single track: Glasgow, urban, 102, including suburbs, 160; Columbus, urban, 96, including suburbs, 124.

Ratio of mileage to area: Glasgow, 5 five miles of track per square mile of territory; Columbus 6.

Ratio of mileage to urban population: Per 1000, Glasgow .12 of a mile; Columbus, .42 of a mile.

Ratio of cars to population: Glasgow, one for each 1340; Columbus, one for each 750.

Passengers per car mile, average: Glasgow, 11.2; Columbus, 4.7.

Average speed per hour: Glasgow, as officially reported, 7.42; Columbus, estimated from schedules, 11.

Average daily wages: Glasgow, about $1.00; Columbus, about $2.00.

Rates of fare: In Columbus, the policy of "one city one fare," price, seven tickets for a quarter, with free transfers which reduce the average fare per trip to about 2⅔ cents; in Glasgow, 14 routes divided into 91 stages, with fares graduated according to distance from one cent to eight, and including the suburbs up to twelve, the average ride in the city being about two miles and costing about two cents. With a half-mile stage for one cent, 2⅓ miles for 2 cents, 3½ for 3 cents, and a trip across the city for from 6 to 8 cents according to distance, the ride is quite as decollete as to fare. If they raised their wages to the American standard, the consequent diminution in the length of their stages, or the diameter of their zones, might compel a resort to differential calculus. The convolutions of such a system of stages or zones, with the different rates of fare charged in each, would be so intricate as to tempt one to paraphase a passage in Hudibras, so as to read:

> Wiring in and wiring out,
> Leaving the people still in doubt
> Whether the car that jumped the track
> Was going out or coming back.

Scotch Thrift.

Dr. Johnson said that the farthing had been adopted as a part of the British currency, to enable the Scotch to give to charity. The dyspeptic doctor, being an Englishman, was prejudiced against his northern neighbors, a feeling in which those of us having Scotch blood in our veins do not share; but while his statement is, of course, a slander, we must admit that the members of the Glasgow Tramways Committee are uncommonly thrifty. In some respects they are so canny as to be almost uncanny, for notwithstanding determined efforts to minimize and ameliorate such conditions, the higher rates for longer rides have borne their legitimate fruits there as elsewhere, as shown by the startling fact that in Glasgow at the last census there were 69,000 families living in two-room apartments and 36,000 families living in one-room apartments, and that there were then living in such so-called "homes" more than 439,000 people, or nearly 60 per cent of the entire population.

But in justice to the management there, it should be observed that the graduated system of fares is not confined to that city. It prevails, not only throughout the United Kingdom, but also in many populous cities in Continental Europe, and is not confined to lines operated by the public authorities. We cannot compare the public operation of traction lines with private operation here, because socialism has not yet established a standard of comparison in this country. Hence I have attempted to contrast the most noted experiment in public operation with at least an average example of private management, the fossilized system of graduated fares with the policy of giving an unlimited ride for a limited fare, one a European product, the other distinctively American. In justice to the American policy, we should remember that while the dream of the socialist may be realized while yet our national emblem merits and receives the revernce of a law-abiding people, its advent should not be hastened by undeserved censure of condition at home or by ignorant praise of conditions abroad. There is truth in the adage now, as there was in the olden time, that "justice without knowledge is impossible."

The Zone System vs. One City One Fare.

Shall America adopt the European system of zones and stages as applied to municipal rapid transit, or will Europe adopt the American plan? This question is already half-answered, for, upon this important subject, Germany is already beginning to see the light and to hear the voice of reason and humanity. The American policy is humane, the European policy inhuman. One is a destroyer of homes, the other a home-builder. The one stands for room, light, air, cleanliness, temperance, health and happiness; the other for darkness, dirt, sickness, intemperance and misery. One promotes intelligence and morality, the other ignorance and vice. One places an embargo and the other a premium, upon social intercourse between all parts of a great city. One punctuates its program with the laughter of happy children, the other with the graves of those who have never learned to laugh and never wore the roses of youth. One promotes virtue, the other crime, for who that reads does not know the meaning and realize the dangers of life in the crowded tenement, where the environment tends to make the boy a candidate for the prison, and tempts the girl to a career that leads to oblivion?

Regulation.

As early as 1848 railroad trains in England had attained a speed of more than sixty miles per hour. But we had no electric railway until twenty-two years ago. Since then the growth of this, the youngest child in the rapid transit family has been phenomenal. Even growth brings grievances and requires new regulations. Government may regulate by legislation. But it would be far better for the public as well as for the traction companies if this power were exercised more by the state and less by the municipalities, especially since communities are being wedded to each other by interurban lines. Wise regulation is not only a sedative for "the growing pains of progress," but also a salutary restrain of corporate power both public and private. Regulation resembles a drug; enough is a medicine, too much is poison. But public regulation and public ownership and operation are as widely separated as the Southern Cross and the North Star, "as far apart," some one has said, "as Dives in Hell and Lazarus in Abraham's bosom." One seeks to guide and control private enterprises, the other to destroy it.

The Demand for Public Ownership.

The demand for public ownership and operation of street railways is but part of the avowed scheme of its supporters to secure ultimately the public ownership and operation of all the means of public travel and communication throughout the country, by the federal government, by the states and by the municipalities. Municipal and state socialism have many advocates. There are those who are known as socialists, and accept its doctrines in toto. They may be dreamers, but theirs are honest dreams. A far larger and more influential class honestly support its propaganda chiefly as applied only to certain fields of industrial activity. They may be credulous, but they are sincere and aggressive. There is still another class, dangerous while clothed with power, which is composed of official spoilsmen, demagogues who masquerade as reformers. Frequently their conversion is sudden, but their asservations of patriotism are calculated to deceive the very elect. "The voice is Jacob's voice, but the hand is the hand of Esau." The persuasive power of patronage and a tendency to hero-worship at long range are among their chief assets. But do not underrate their influence. They are unscrupulous and skillful in the use of the muck-rake, for no one knows better than they that falsehood will run a mile before truth can put her slippers on. But why leave the field to them? What better subject than this for a campaign of education. A cause that is just means a battle half won.

Individualism vs. Socialism.

The cornerstone of our institutions is individualism, not socialism. It is a priceless heritage which the American people can afford to surrender. It was written for them in the fundamental law under which was organized the best form of government ever devised by the wit of man. Guided by the spirit of that document, we have attained the greatest material prosperity and the highest ideals known to civilization. Now that its wisdom is assailed, we must decide whether the path of progress lies throught evolution or through revolution, through steadfast adherence to principles established by infinite sacrifice, confirmed by experience and hallowed by time, or through apostasy to the most cherished American ideals. That is the question which confronts us. In its far-reaching import, it is more important than any other now before the American people. Its proponents are active and earnest. It is a living issue. It must be met. eLt us meet it then, not with "the flames of faiht* * * flickering like the deserted altar fires of a forsaken worship" but promptly, bravely, ardently, determined

"That all our fathers wrought,
With true prophetic thought,
Must be defended."

PREVENTION OF ACCIDENTS.*

BY FRED W. JOHNSON, CLAIM AGENT, CONNECTICUT RAILWAY & LIGHTING COMPANY.

Introductory Note.

In writing this booklet in connection with our accident work, we had two purposes in mind:

To teach you to avoid accidents.

To teach you to handle accidents.

For the past two years we have been making a determined effort to reduce both the number and the severity of our accidents.

The results have been very gratifying and I take this opportunity of personally thanking the conductors and motormen for the interest which they have shown in our work, and for their efforts to assist us in keeping accidents down.

We are ambitious to make this summer the very best summer that we have ever had, from a freedom-from-accident standpoint, and we are confident that we can do it if every man will do his best.

But remember this that it takes but one careless man to wreck an entire summer's record. A moment of forgtfulness or of carelessness, and down comes the crash.

And this warning is not pointed at the man sitting next to you. It's fired straight at you.

SUGGESTIONS.

Accident.

By the word accident, we mean mishaps of all sorts which occur on your car, or in close proximity to your car, or which are caused by your car. In fact, any mishap or unusual occurrence in which this company is concerned, or is liable to be concerned.

Likewise does this include mishaps which in reality do not concern our company, but out of which it is possible that claims may arise against the company, founded upon distorted facts.

A woman was hurrying to catch a car, some weeks ago, and as she stepped from the sidewalk she tripped and fell. She was a distance of some ten feet from the car, but afterwards claimed that the car had been started just as she was about to board it, and that she had been thrown clear over to the gutter, where she was picked up. But our report of the affair contained the facts, with witnesses to support them, and we soon convinced her that she was barking up the wrong tree.

The twelve o'clock whistle blows, and off goes a grocery team, the horse bound for the stable, without waiting for the driver. If the driver can find a trolley car within a block or so, he promptly blames the motorman for causing the runaway.

Furthermore, the term includes all fights, rows, disputes, disturbances and unusual occurrences which take place upon our cars.

Courteous Treatment.

We are largely dependent upon the good will of our patrons to assist us in investigating our accidents.

And the average person will do more for you or for me in response to a pleasant word and a gentlemanly request for their name and address, than they would for any amount of rough treatment and a curt demand for favors.

Furthermore, it is a splendid idea to lay a good foundation in this respect, by endeavoring to be uniformly courteous toward those with whom you come in contact each day, and not to wait until you have met with an emergency before you begin to show the pleasant side of your nature.

As an investment, there's nothing on the market today which is giving returns equal to those of common, every-day courtesy.

Read Our Weekly Bulletins.

Once each week we post accident bulletins upon our bulletin boards in all of the car barns, offices and lobbies.

These bulletins deal with entirely different subjects each week, and are founded upon current accidents as they arise on our various divisions.

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We endeavor to point out to you where the other fellow has made his mistake; or where he was lame in his work; how to handle all sorts of accidents in our line; what to do, how to do it, when to do it and what not to do.

We try to make these bulletins interesting and instructive to you.

We ask that you devote two or three minutes each week to careful reading of them.

And then try to benefit by them.

Stepping from Moving Cars.

These accidents outnumber all others, ten to one, during the open-car season.

They are constantly occurring from the time when the first open cars go out in the spring until the last of them are taken off in the fall.

There's a fascination about stepping onto and off of open cars of which the public never seem to tire—until they happen to get hurt. And then there is a terrific squeal, always aimed at either the conductor or the motorman.

Many people are injured each summer in this manner. Some of them escape with bruises; others are more severely hurt, while always a certain number are killed.

We do everything possible to warn people of the danger. Warnings are placed upon the seat backs. Danger cards in both ends of every open car. The time tables contain warnings, and lastly, all conductors and motormen are instructed to shout out warnings to all persons about to jump on or off, if they believe that there is the slightest danger in their so doing.

Furthermore, wherever possible to avoid an injury to a passenger from this source, for the conductor to grab them and hold them onto the car until it has stopped.

Especially do we instruct you to do everything in your power to prevent women from jumping from moving cars.

We have often found in the past that many women alight from cars which they suppose to be at a standstill, when as a matter of fact they are in motion.

This likewise applies with equal force to the foreign element who are even more clever in this respect than are the women passengers. They all aspire to be acrobats, and certainly are without equals when it comes to doing a spectacular backward jump from a moving trolley car.

Oftentimes, the louder you shout to these foreigners, the quicker they will jump. But shout, by all means, for not only do you warn them, but also you call the attention of other passengers to the impending danger.

Then, should an accident occur, you will have plenty of good witnesses.

In any event, in accidents of this sort, get your witnesses, and lots of them. For it will surely be claimed afterwards that you stopped the car for the passenger to alight, and that just as she was about to get off, that you started the car and threw her into the street.

So get your witnesses, every time, and lots of them. Then we can meet the aggrieved party the next day with a cheerful countenance and a heart full of sunshine, for we shall know that we have the goods on them, in spite of their falsehoods and their fake witnesses.

Wait until the car stops.

Get your witnesses and lots of them.

Look Car Over Carefully.

It is taking terrific chances to start your car while any passenger is boarding or alighting.

And particularly dangerous is it for you to start your car while women, aged persons or invalids are either boarding or alighting.

Well do we realize that no conductor would purposely do such a thing. Likewise do we feel that there is little likelihood of its happening so long as a conductor has a fairly clear view of his passengers.

But here is the danger.

That you will ring the two bells some day when your car is well filled, possibly with men standing on the running board, and your view of passengers boarding or alighting, is somewhat obstructed.

That's where you've got to be very, very careful.

You know what a time elderly people have in getting off of a car; how they sort of crouch down so that it oftentimes is exceedingly difficult to see them, if there are passengers on the running board.

Then, again, in the case of women getting onto or off of the cars, where they have small children to lift on or off. You've got to watch out for them, for they lose their head entirely if they think that the car is going on with or wihout the little ones, as the case may be.

Don't pull in those two bells until you have looked your car over carefully.

Nor until you have sighted up and down the entire length of the running board and it is safe for the car to start.

Otherwise it is a most serious matter.

Rear-end Collision of Cars.

Cause—The rankest kind of recklessness.

Always the same old excuse.

The second car was following the car ahead too closely. The first car made a stop. The motorman behind did his best, but it was of no use. He was up against it and so was the company and likewise the passengers of the two cars, whose safety lay in his hands.

And all this in spite of the warnings that we are constantly shouting until we are practically black in the face from our exertions.

Be it said to the credit of the older and more experienced motormen that it is indeed rare that we find one of them responsible for these disastrous rear-end collisions of cars.

They fully realize the danger of the situation and are content to lay back a good block, wherever possible. And then the car ahead can make all kinds of sudden and unexpected stops and there won't be any rear-end collision.

That man ahead may have to reverse to avoid an accident and you certainly will if you follow him too closely.

Again and again and again, we say, hold back; give that fellow ahead plenty of good, safe room.

Collisions With Teams.

They about all happen in the same way.

And there are always a good many of them.

The car and the vehicle are both going in the same direction. The car approaches the team and is about to pass it when the driver suddenly and unexpectedly pulls his horse onto the track and squarely in front of the moving car.

If the motorman has made allowances for this, there is no harm done, though the motorman may be doing a whole lot of thinking about that particular driver.

But if the motorman is just blundering along with never a thought of the possibility of an accident from this source, there is sure to be a beautiful mix-up.

In passing vehicles of all kinds, going in the same direction as your car, take no chances.

The man ahead has the right of way. We have to look out for him—not he for us.

Speed of your car right down and the gong sounding constantly until you have passed safely.

Jigging Along.

Many accidents happen in this way:

The motorman of a car has nearly reached his stopping place; but for some reason he continues to jig along a few yards until he gets to it. Possibly there is a team or car just ahead of him.

The car slows up almost to a stop and then starts up again for a few feet or yards, proceeding in this way until he has covered the short distance intervening.

Meanwhile his passengers are anxious to alight and think that each time that the car slows up almost to a stop that it is going to stop.

Some woman passenger decides that the car will certainly stop this time; attempts to alight just as the car is started up again for another few feet. The woman is thrown and injured and there you have a needless accident.

This hitching along in order to gain a few feet in distance, where there is little or no need of it, with passengers anxious to board or to alight from an open car will invariably result in accidents.

And accidents are what we are trying to avoid.

If you are going to make a stop, make it.

Your passengers aren't mind readers.

Passengers on Running-Board.

The running-board of an open car is a dangerous place for a man.

Whether he be conductor or passenger, he is in danger of being injured through the carelessness of himself or of the motorman or of the driver of some passing vehicle.

In passing vehicles of all kinds and obstructions close to our tracks, our motormen have got to proceed very cautiously and very carefully that neither our conductors nor our passengers may be injured by being raked off of the running-board.

Particularly dangerous are the shafts of wagons which are backed up to the sidewalk with the ends sticking out in close proximity to passing cars.

We have in mind an accident of this sort which happened on another road, in which a reckless motorman raked the entire running-board of his car, sweeping off 12 or 14 men and seriously injuring many of them.

Keep this fact constantly in mind and never, for a moment, expose your passengers or your conductor to this danger.

Within two years two of our conductors have been killed and one permanently injured for life from running-board accidents, besides several serious accidents to passengers.

A Means of Protection.

We have a rule which is a safe guard to the conductors and to passengers from the foregoing danger.

The rule provides that upon approaching a team or obstruction which stands close to the track, or, at least, sufficiently close to constitute a menace to anyone who may be upon that running-board, the motorman immediately slows his car right down and gives his conductor two strong bells on the signal cord.

The car approaches the obstruction at slow speed to enable the conductor to sight down the running-board to determine whether the car and passengers will pass in safety.

If it will pass safely, the conductor gives his motorman two bells, the motorman proceeding past the obstruction very cautiously.

If the car will not pass safely, the conductor gives the motorman one sharp bell and the car stops before reaching the obstruction.

Likewise, should no bell be returned by the conductor; the motorman will stop before reaching it.

When passing in close quarters, warn the passengers to beware of the obstruction and proceed cautiously.

Passengers on Wrong Running-Board.

This accident happened on one of our divisions last summer.

Several cars were at the ball grounds. Part of the crowd wanted to ride on the running-board on the inside of the double track. Eventually they persuaded the conductor and motorman to let down that running-board and they crowded onto it.

The conductor was a new man and evidently did not realize the extreme danger of the scheme. The motorman was a man of some years experience and should have known better.

The car left the double iron and soon reached a turnout. Here the motorman tried to squeeze past another car on the turnout, with his inside running-board still occupied by passengers.

And as a result most of the men on that running-board were caught in a trap and were crushed between the two cars. Many of them were very seriously injured.

Needless to state, that inside running-board should never have been let down, much less to have allowed passengers to occupy it.

Side Bars.

Side-bars prevent accident.

But unless they are used intelligently and according to regulations they prove to be a direct cause of accidents.

Never put up a side-bar while the running-board on that same side is turned up. And never turn up the running-board until the side-bar on that side has been lowered. Otherwise passengers are liable to step out, expecting that the running-board is in place and thus get terrific falls.

In letting down the side-bar, don't let it down with a slam. Passengers have been badly hurt by just such work as that.

In putting the side-bar up, see that it is safely and securely caught by the appliances for this purpose. Then it cannot fall and strike anyone.

Platform gates and chains shall be kept closed or hooked on their proper side. They won't prevent accidents if you leave the mopen. In fact, they will cause accidents if left open.

Insist upon passengers getting on and off on the proper side of the car.

Passengers shall not open the gate or chain to alight from the wrong side of the car.

Nor shall motormen leave their operating post while their car is in motion to assist in adjusting side-bars, running-boards, platform gates and chains, signs, signals, etc. This practice is emphatically and expressly forbidden in the company's regulations.

Starting on One Bell.

Two bells is the signal to start the cars.

Two bells shift the responsibility for starting from the shoulders of the motorman to those of the conductor. If there is an accident due to starting, the fault is not that of the motorman.

A start on one bell, should there be an accident due to the starting of the car, places the responsibility for the false start squarely upon the motorman.

And we have plainly pointed out to you the seriousness of starting the car while passengers are boarding or alighting.

Therefore, our remarks in this connection are directed squarely at the motormen.

Oftentimes a conductor will pull in the first bell just as some passenger decides to get onto or off the car. The motorman waits for his second bell and there is no accident. If he starts on one bell, there is an accident and the motorman will foot the bill and not the conductor.

Therefore, we say to you, motormen, insist upon having two bells before you move your car an inch.

Two bells—not one bell.

Passengers Not to Ring Bells.

It is oftentimes impossible for a passenger of a well filled open car to attract the attention of the conductor while he is collecting fares and giving out transfers.

It therefore becomes necessary for the passenger to ring the bell to stop. Certainly this is preferable to having him make a flying leap from the moving car.

But the company does object, most decidedly, to allowing passengers to ring the two bells to start the car. Under no circumstances is this to be permitted. The chances for an accident from this source are altogether too great.

The duty of giving the starting signal rests solely upon the conductor and he alone shall be held responsible for the safe starting of the car.

Keep Hands Off Bell Rope.

The foregoing reminds us of a regulation of the company, which is not generally understood, we believe.

That is, conductors shall keep their hands off the bell rope until they are ready to immediately transmit the signal.

The rule is intended to guard against the conductor's unintentionally giving a bell, while waiting for passengers to board or alight, thus causing a false start by the motorman, with the prospects good for an accident.

Keep your hands off the bell rope until you are ready to give the signal.

Passing Standing Cars.

Here the great danger is that someone may step out from behind the standing car and onto your track directly in front of your moving car.

Especially are children liable to do this very thing. They will dart out from behind a standing car with never a thought of any car going in the opposite direction.

That this danger is a serious one is ably attested by many accidents of just this character with which we have been connected in the past, a very considerable number of which have resulted in deaths.

In the case of women who step out onto the track and in front of a car in this way, we have found that many of them become terrified and utterly unable to move from the track.

Women and children are most liable to be injured in accidents of this sort. And altogether too often the injuries result very seriously.

In passing standing cars, bring the speed of your car right down, sound your gong constantly and be on the alert to stop quickly, should occasion demand it.

Children.

A warning in this direction is especially applicable at this season of the year when the number of children playing in the streets is the greatest.

And about all that we can say to you is to be very, very careful. Use your best judgment and be constantly on the alert for children in front of or about your car.

They will appear in the most unexpected of places and will do the most unexpected things. And the only safeguard is to be on the watch for them constantly.

It is not safe to assume that a child will continue on across your track or will stop before reaching your track or will get out of the way before you reach it or that it is aware of the approach of your car.

You've got to play it safe. You cannot assume anything in regard to the child's movements or intentions.

Children shall not be allowed to play on, near, under or about a car.

Last summer a certain conductor had had a practice of picking up a little child as he neared the end of his run and of letting it ride to the end of the line and back. One day it jumped from the car and was killed and the company was blamed for having allowed it to be upon the car under these circumstances.

Children do not and cannot appreciate a situation of danger.

The responsibility rests upon our shoulders to look out for them.

Therefore, be very, very careful.

And don't take chances.

The Gong.

The gong is a great factor in preventing accidents, especially collissions with teams, autos, bicycles and pedestrians.

The first claim always advanced after a team has run into a car is that the motorman of the car did not sound his gong. That's a stock claim in accidents of this character and though notoriously threadbare and decrepit, is invariably called upon to do duty.

And so we say to you, emphatically, sound your gong and keep sounding it. Give people full warning of your approach. Many teamsters drive around the streets in a daze and never give thought to the trolley cars until you wake them up with the gong.

Sound your gong and keep at it. It's far better than having accidents.

Railroad Crossings.

We often say to ourselves:

"What does that conductor think that he's out on that railroad crossing for?"

And there he stands on the crossing with a red flag tightly wadded in his hands, meanwhile looking in but one direction and hiding the red flag with his body from the view of any engineer approaching from the opposite direction.

A whole lot of protection he is to the passengers in his car about to cross over the railroad! That conductor is out there because he has got into the habit of it and not because he thinks that he's of any use there.

Some frightful accidents have happened on grade crossings, in which trolley cars have figured prominently. And our own road has had several very narrow escapes within the past few years.

Twice have our cars crashed into trains running over the crossings and each time passengers have been seriously injured, the escape from fatalities being miraculous.

Both collisions were due to the rankest kind of contemptible recklessness on the part of our own employes.

Stop your car at a good, safe distance from the crossing. If your rail is treacherous, you know it long before you reach the crossing, and it is for you to make allowances for this.

Wait for your signal from the conductor on the crossing. Then look your car over carefully before you ring the two bells to start.

Cars shall not pass on railroad crossings.

Conductors shall look both ways before giving the signal to come ahead.

Open out your red flag and wave it so that it can readily be seen by engineers in both directions. The same with your red lantern at night.

Never allow your car to stop on a railroad crossing. Go ahead, if you have to push a team before you until you clear the crossing.

Remember that you are running the crossing as a measure of protection for your carload of passengers.

It's the most dangerous situation on your run.

Falling Registers.

Many serious accidents have happened in the past, caused by registers falling and striking passengers, generally upon the head.

A register is a heavy and a dangerous thing to fall upon a person and people have had their skulls crushed and have died as the result of accidents of this sort.

The danger from this source is ever present upon lines where conductors have to change their registers on each trip or so.

If the register is put up rightly it will not and cannot come down. Those which have fallen in the past have done so because the conductor was careless in putting them up or in taking them down and some passenger was injured as the result of his slipshod work.

Every time that you put a register up, see to it that it is securely fastened and that the pin is set in tightly.

The conductor who puts the register up is the man who will be held responsible if it falls.

Protect Yourself.

Through the course of a year there are always a number of serious accidents, aside from those of a minor character, to our conductors and motormen.

In the past few years we have had accidents in which conductors and motormen have been killed and others severely injured. Many of these accidents have arisen from carelessness on the part of the men injured and others from the thoughtlessness of their fellow employes; still others have happened from causes over which neither they nor the company had any control.

And along this line do we particularly warn conductors of the ever-present danger of their slipping or falling from the running-boards of open cars.

The running-board of an open car is a notoriously dangerous place for a man who is inclined to be careless.

Without question, the greatest danger to a conductor while working on the running-board is that he will be swept off by colliding with some passing vehicle.

The recent death of one of our conductors from an accident of this sort is still fresh in our minds. We have had other conductors who have been killed and still others who have been seriously injured in these accidents.

Right here, we shall again instruct the motormen that they shall take every precaution to protect their conductors and their passengers from collisions of this nature by slowing up, giving their conductor the customary two bells as hereinbefore outlined and then proceeding cautiously past the team or obstruction.

The motorman who deliberately attempts to brush past teams or obstructions close to his track, well knowing the possibility of sweeping conductor or passengers from his running-board and by such work does injure or kill any of them, is guilty of manslaughter, should such disregard of the safety of others result in death.

And under such circumstances, the motorman need expect neither the support nor sympathy of his employers.

Poles Close to Track.

The company intends that all poles or other obstructions which might endanger the safety of passengers or of conductors working upon the running-boards, shall be set at a safe distance from the track.

There are a certain limited number of exceptions to this policy, due to circumstances over which the company has no control; also, some instances where it is absolutely impossible to set them back any further.

Some of these exceptions are large trees, which necessitate that conductors shall watch out for them and shall warn passengers of them; furthermore, that motormen shall slow down and operate very cautiously when approaching and passing them.

Dangerous poles or obstructions of this sort should be reported at once to your superintendent, and if it is possible to better conditions, rest assured that they will be.

Report Defects.

All defects in cars, poles, tracks, wires, roadbed, etc., should be reported promptly to your foreman, inspector or superintendent to enable the company to make immediate repairs and thus to avoid accidents.

Defective brakes, gongs, bells, controllers, switches, loose grab-handles, defective car steps, floors, running-boards, seats, headlights, lanterns, fenders, signals, etc., should all be reported and reported at once.

After an accident has happened, it sometimes occurs that a conductor or motorman will attempt to place the responsibility upon a defective car appliance, even claiming that it has not been in proper condition for some time.

If that alleged defect had been reported and had not been attended to, then the employe should not be held responsible for its failure to work properly at the time of the accident.

But if it was known to the employe and was not reported, then the employe has no cause for complaint and no allowances.

Report defects promptly.

Safe Landing Places.

Law and common sense require that we shall select safe landing places for passengers to use in alighting from our cars.

But it certainly is not selecting a safe landing place for us to stop our car for passengers to alight at a point where they are reasonably certain to be injured if they do step off. We've got to keep on until we do find a place that is safe for them to alight.

We have had conductors and motormen who have stopped their cars and have allowed passengers to step off into open trenches, deep ditches, on bridges where they have fallen between the ties and onto piles of building materials, rails, ties and other obstructions.

Accidents of this sort are most common in the cases of women passengers. They are sure to be hurt if the conditions are at all dangerous.

Especially do these accidents happen at night, when it is difficult for passengers to see out into the darkness.

If your car has to stop in a locality dangerous for accidents of this sort, warn your passengers not to alight from the car.

Pick out a safe place for them to alight.

Automobile Accidents.

Keep your eye on these auto drivers.

Experience shows that many of them are reckless in the extreme and that they will take the wildest kind of chances.

Many of them have a dangerous way of shooting out of side streets and around blind corners at terrific rates of speed and of then denouncing anyone who happens to be so unfortunate as to be unable to get out of their way in time.

Furthermore, recent accidents show that some of the operators are inclined to shave past cars as closely as possible, to the endangerment of the occupants of our running-boards.

We would also call your attention to the fact that the drivers of some of the machines are not in a responsible condition at times and that the burden upon us for avoiding collisions with them is, at such times, all the greater.

In auto accidents, secure the set of numbers on the back of the machine and don't let them get away from you until you have done so.

Then get the names of the occupants of the auto.

Running from the Rear-end.

Some months ago we had this accident.

The car had broken down and it became necessary to operate it from the rear end. The conductor took his position upon the front end, his hand on the bell cord to signal the motorman, as required in the regulations.

It was at night, and, instead of proceeding cautiously, the motorman put the power on the button and the car flew along.

Well, they hadn't gone far before they crashed into a carriage, killing one woman, seriously injuring three others and the driver, besides demolishing the carriage and injuring the horses.

If it is absolutely necessary that a car should be operated from the rear-end, follow out your regulations for such an emergency and proceed, very, very cautiously.

Controllers.

In past years many serious accidents have followed the blowing up or the flashing of fire by defective controllers.

And especially great is this danger on the open cars, where the first impulse of passengers is to jump from the car, even though it be under fast headway.

We have known of many accidents of this sort which have resulted in serious injuries to passengers and have been connected with a considerable number in which people have been killed outright because of their having become terrified into jumping from moving cars.

If, therefore, you have reason to believe that your controller is in a condition dangerous to operate, you are not justified in continuing to operate it to the endangerment of the safety of your passengers.

Under such circumstances, your passengers should be transferred immediately to the next car following and the car sent direct to the barns for a thorough inspection.

Nor should you continue to operate your car with passensengers on board if it has caught fire. Passengers are quick to become terrified into jumping from the car, though it be in motion.

And the women passengers are the first to start the panic and the first to jump and consequently the first to be injured and generally the most seriously so.

An ounce of prevention at a time like this is worth a ton of excuses afterwards.

Fire Apparatus.

During an alarm of fire, motormen shall cross intersecting streets very cautiously.

Upon the approach of fire apparatus, stop your car at a good, safe distance and give them all the time and room possible.

The right of way should likewise be promptly given all hospital ambulances.

Unnecessary Conversation.

"The motorman was talking to a passenger and didn't notice the team until it was too late to stop."

And here we have the explanation of the cause of many a serious accident in the past. Accidents that never would have happened if the railroad man had been attending to his own business.

Does it ever occur to you motormen who so enjoy a chat with a passenger, that when you enter into conversation with some talkative individual, that you are sitting over a keg of dynamite while you proceed to give part or all of your attention to the conversation?

The practice is emphatically forbidden by the company's regulations.

While your mind is off your work and your eyes are off the track ahead of you, you are endangering the lives of the people who are riding back of you and under your protection.

Furthermore, you are endangering the safety of every other person who may be using the street in front of you.

Your work is of a responsible character and demands your whole, undivided attention.

Keep your eyes ahead of you.

Your mind on your own business.

And accidents will become so scarce that we'll discharge the claim agent and his whole department.

Disabled Cars.

Bang!

Something's gone wrong and the car stops in darkness and on a suburban line.

What's the first thing that you're going to do without stopping to think, consider or argue?

You're going to prevent other cars from crashing into your car, aren't you?

And this, too, even though the cause of your halt may be of a serious or of a trivial nature, provided it is of anything more than the merest temporary kind of a stop, with no car immediately following or approaching.

Likewise, is this precaution of great importance in even broad daylight, if the stop happens to be just around a curve or bend.

We've had some terrific collisions of cars in the past, all due to the failure of our conductors and motormen to realize that cars in the rear (and in front as well, on single track lines) have got to be flagged and flagged at once.

You may have collided with a team or obstruction on the track; you may have run over a man; you may have struck a stray horse or cow; your car may have become disabled, etc., etc. We've had them where the trolley pole left the wire, and while the conductor was fishing around in the darkness, the car following collided with him.

Station someone a good distance in the rear and in front on single-track lines to stop and to warn all approaching cars.

And be lively—think quickly—for it generally happens that you've got but a few seconds in which to act.

Get back and flag that car.

Special Cars.

Especially those conveying picnics, where there are always a good many children.

Serious accidents have happened in past summer seasons because here and there a conductor allowed the children to roam around the car and sooner or later some of them got injured.

They should be forced to remain in their seats while the car is in motion, and under no circumstances should they be allowed on the running-boards.

They should be cautioned and obliged to keep their hands, arms, heads and bodies inside of the car, especially on double track lines.

With these specials, it is probably needless for us to add that the greatest caution must be exercised by the motorman to avoid colliding with other cars and particularly the car ahead.

On special car work the conditions favor accidents and the most careful work is absolutely essential.

Don't Get Rattled.

We've had accidents where conductors or motormen have lost their heads completely.

Just got rattled and didn't know what to do or how to do it. And so their passengers took hold and handled the accident for them. Which is decidedly humiliating to us.

If you will follow our instructions in accident work, giving us close attention and careful thought, we know that you will be well equipped and qualified to handle any accident that may happen in the course of business in a way that will reflect credit upon you and upon the company.

Once that an accident has happened, keep cool. Don't lose your head and get excited. Take whatever time is necessary to straighten out matters. You are in charge and for the time being you are the company.

If you read our bulletins each week and give careful thought to what we have to say, you'll know what to do when your turn comes without having to stop and hesitate.

In an emergency, the passengers look to the conductor and motorman to take entire charge. If the railroad people get rattled, what can we expect of their passengers.

Keep cool and do your best.

Witnesses to Accidents.

The witnesses to an accident are the people who saw it.

Also those who were in the vicinity and should have been in a position to see all of it or some part of it, though it is impossible to determine just how much at the time.

Of course we prefer the names of those who saw the accident to those who did not, but people will sometimes claim that they did not see an accident, merely to avoid giving their names.

So, we say, never mind what they say; get their names if it is possible and we'll find out later on what they know about it.

Again, people who did not see the actual accident, but who were in the vicinity at the time, have proven valuable witnesses.

Get the names of disinterested people first and the names of company employes afterwards.

We've got to have witnesses to all of our accidents. We've got to be able to establish the facts, if necessary, whether they be in our favor or against us.

Furthermore, we've got to have an abundance of witnesses to every accident. It not infrequently is some small mishap which develops into a serious one.

A considerable number of witnesses are necessary because of the fact that of the total number obtained, many of them often are able to furnish but little information concerning the accident.

Witness Cards.

We will devote but little time to the cards, as we believe their use is well understood.

Each conductor and motorman shall carry at least one of the witness packets. Two packets are preferable to one.

The packet contains nine cards—one for the injured party to sign and the other eight for your witnesses.

Immediately an accident has happened, the conductor and motorman will hand their cards around to those who should be in a position to shed light upon the manner in which the accident happened.

The cards are then all returned to their respective envelopes and the conductor and motorman hand in their envelope of cards with their regular accident report.

The conductor copies the names of his own witnesses onto his report. The motorman need not do this for the present, but must hand in his envelope of cards as does the conductor.

Always sign your name, as conductor or motorman, on the front of your witness packet envelope before handing it in with your report.

In going after witnesses, go after them strong. If you waver or hesitate, it gives them courage to refuse.

Have confidence in yourself.

Trippers.

Just remember that that party who jumped from your car yesterday while it was in motion will be around today claiming that you started the car while he was alighting.

So while you're about it, secure a good lot of witnesses and we'll be on the sunny side of the street.

And, by the way, pay not the slightest attention to what the injured party has to say about the making out of your accident report.

He usually acknowledges the corn at the time of the accident, but there's nothing to prevent him changing his mind after he's talked it over with his friends.

So we shall look for an immediate report upon every accident that you may have. And don't let that fact slip your mind, either.

Brace up and have barrels of confidence in yourself. You've got to go after your witnesses with the energy of a country constable. And you'll land them if you do.

Don't go around asking people if they saw the accident. They'll all say that they didn't. Figure out who should have seen it and then hand them your cards on the spot.

Some people fear to give their names because they have an idea that we go around telling the public who our witnesses are. That's one of the things that we don't do.

All hanging wires are grand good things to let alone. They are alive until proven dead. Send for the linemen. And meanwhile keep everyone away from the wire.

Don't frighten children into jumping from your car while it is in motion. Stop the car and put them off in safety.

The regulations require you to trip your fender at the end of each half trip or terminus.

A whole lot may depend upon the proper tripping of those fenders before you are through work for the day.

And if they don't trip properly, report them.

Wait until the car stops.

And roar it out as though you were a real live man.

Don't allow passengers to sit or ride upon your fenders, front or rear, nor upon your platform gates or chains. They are not made for this purpose and are liable to give way under their weight, causing accidents.

What are your regulations about running cars on the wrong track?

Positively forbidden to run a car on the wrong track until your conductor has gone ahead of you far enough to stop approaching cars. That's right, isn't it?

A red flag or lantern signify danger.

And yet we find a man once in a while who will run squarely against a red light or flag. This is—until the superintendent gets wise to their ideas.

Motormen shall not assume that any signal is intended. The bells must be clear and distinct.

And ring good, strong bells. Not the weak, indistinct kind.

Passengers shall not sit upon the floor of the car with their feet resting upon the running-board. They are in the way of other passengers and of the conductor and are not in a position to watch out for their own safety. Have them stand up either between the seats or on the running-board.

Under no circumstances shall a motorman leave his operating post while his car is in motion except leave his imminent danger to himself and then only after he has done all in his power to minimize the impending danger.

If you happen to hear strange sounds from beneath your car, don't hang over the side to find out what the cause it. You may be knocked off and injured, while your car continues on, possibly resulting in a collision of some sort.

Know that your switch tongue is properly set before your car goes over it. Never assume that it is properly set because it happens to be a switch that is not in regular use.

In backing cars up:

After the usual signals have been given, the conductor faces the rear, with trolley rope in one hand and the bell cord in th other. Then he is in a position to signal the motorman to stop in case of danger.

We have had accidents on some of our large cars, due to the fact that the front trolley pole was not properly hooked. The poles have jarred loose, flew up and upon one occasion turned over and came down through the roof of the car.

Give information concerning accidents to no one, unless you are positive that they are connected with the company and have a right to the information.

Caution passengers against sticking their arms or heads outside of the car where they are liable to be struck by cars going in the opposite direction.

A report on every accident.

Do you make a practice of regularly trying the hand-brake on your air-brake cars? That hand-brake must be in proper working order for emergencies. If it isn't, report it immediately.

Derailed car—Have your passengers alight before you attempt to get the car back onto the iron.

Careful about your signals, red flags and lanterns. Carelessness in this direction results in the worst catastrophes we have in railroading.

Don't tear up to a switch, curve, team or car and then attempt to make a spectacular stop. Some day something is sure to go wrong and in the next 20 seconds you'll learn a whole lot that hadn't occurred to you.

On air-brake cars the great danger is that the air will fail you at the critical moment. Watch the air gauge.

No women or children to be allowed to ride on car steps, platforms or running-boards. They're too liable to fall off.

In case of stampede among the passengers of your car, do all in your power to prevent them from jumping from the car while it is in motion.

Passengers who jump from moving cars because of fear, invariably are worse injured than they would have been had they remained upon the car.

Don't allow bicycle riders to hang onto any part of your car or fender.

Drunken drivers, passengers and pedestrians are responsible for many of our accidents. Don't take it for granted that the driver of every team that you meet has his brains with him.

Conductors and motormen will not assume charge of the baggage of passengers.

If you carry bundles of newspapers on your car, in putting them off, simply drop them beside the track.

Never hurl them across the roadway to the sidewalk or gutter. Bad accidents have resulted from this practice in the past.

Allow aged persons, invalids and cripples and women with children in their arms to get seated before you ring the bells to start.

In running your car into crowds of people waiting to board it, use your gong liberally and shout to them to wait until you have stopped. Then they won't get an arm or a leg taken off under the wheels.

Be particularly careful in operating your car in the neighborhood of school houses.

Notify the crews of other cars on the line of the presence of dangerous obstructions, drunken drivers or pedestrians, so that all motormen may be on the lookout for them.

If your car happens to be a few minutes late, don't bawl it out so that everyone on your car will know of it.

For if you do and your car happens to meet with an accident afterwards, your passengers will all believe that you were running very fast to make up time.

Just note the locations of doctors, drug stores and telephones along your lines. Then you'll know just where to go, if you happen to meet with an accident some night and have but a few seconds in which to act.

The company pays all doctors for first services, when rendered at the request of the conductor or motorman. The doctor will then communicate with the office for further instructions.

If you leave a wagon, dead horse or other obstruction on or near the highway at night, put a red lantern on it.

If you have had an accident, don't get rattled and forget your regular duties, for a second accident, due to haste, won't help matters a bit.

You are not to talk for publication regarding accidents. Your superintendent attends to this duty, and if you will be so kind as to refer all inquiries of this sort to him, we know that he will appreciate your thoughtfulness.

The motorman who reverses the oftenest, isn't always the best motorman. Use your head and keep out of dangerous situations that require the use of the reverse.

Don't announce the details of an accident after its occurrence, to the crowd of curiosity seekers who are sure to be present in abundant numbers.

Keep your mouth shut, look wise, secure your witnesses, assist the injured party, and proceed. Let us have the full details in your accident report.

Hand signals to be operated by no one but the conductor. All others to keep their hands severely off of them. Be certain that you are right before you throw your signals. Do your thinking before rather than after you operate your signals.

We don't own the streets or highways. Therefore we have no business to tear through streets or roads which are under repair, or where the driving for teams is difficult.

Brake-handles, both front and rear, are to be kept free and clear. Nothing must hang upon them You cannot use that brake in case of an emergency if there are lunch baskets or baby carriages hanging onto or around it.

We once had a serious accident due to the fact that a conductor didn't know what to do quickly when he suddenly got three bells from his motorman as his car sped along.

We presume that you would know what to do without losing valuable time in thinking it over.

If your headlight or fender is out of order, proceed very cautiously. Its a bad handicap to struggle under if you should happen to meet with an accident.

We all make mistakes. But don't make the mistake of not reporting every accident. We have had but one such instance in the last ten months and the prompt dismissal of the crew followed.

On rainy days, with the side curtains pulled down, be very, very careful not to start your car while passengers are boarding or alighting.

If your rail is slippery or treacherous, bear that fact constantly in mind when running up to switches, curves, cars, teams, railroad crossings and pedestrians.

You've got to make allowances—not excuses.

Here's a piece of brilliant work that one of our motormen turned out some two years ago:

He collided with a baker's wagon and brushed it aside, doing considerable damage. After he had got well past the wagon, he suddenly thought of his reverse, and apparently thinking it best to make a good job of the deal while he was at it, he threw on his reverse and came piling back into the outfit, this time boosting the whole shooting match into the river which ran alongside the roadway.

You've got to guard against making bad matters worse by forgetting to stop your car from shooting backwards after you've reversed.

The time to report defects in a car is before you have the accident and not afterwards.

Never allow your passengers to turn your car lights on and off, pull your trolley pole or operate your car. Disastrous collisions of cars have resulted from such work.

Some motormen have a trick of releasing their brake by letting it spin around rapidly.

These flying brake handles have resulted in serious accidents to the motormen themselves and to passengers. They hit a terrific blow if they happen to strike anyone.

Furthermore, what control of his brake does a motorman have if his conductor suddenly gives him one bell on top of his starting signal? He's got to fish around for that handle before he can again apply his brake.

Emergency stop. Three bells given in quick succession by the conductor, car in motion, call for an immediate stop, without the use of the reverse.

Bear in mind that some of the worst catastrophies in the history of street railroading have happened because:

The motorman forgot where his curve was and shot into it at such a rate of speed that his car left the rails, turned on its side and ploughed along with terrible results.

Though you may be off duty, if you chance to be present at the time of an accident, whip out your cards and land some witnesses.

Keep your eyes ahead of you. Let the conductor run the rear end of the car. That's what he's there for. You've got all that you can attend to right ahead of you.

In turning car seats be careful not to jam the hands or fingers of passengers.

When you see the hat of some passenger blow off the car, keep your eye on the passenger while the car is slowing up. Many a passenger has got rattled at such a time as this and has jumped off while the car was under high speed and have been badly injured and even killed.

If the injured party or any of his friends ask for the names of your wintesses, just hand them a bland smile and refer them to your superintendent. He will be glad to accommodate them, if possible.

Careful not to start while passengers are boarding or alighting.

Careful of teams going in the same direction as you car.

Careful of the car ahead. No rear end collisions.

The H. W. Johns-Manville Company, of New York, exhibited a most extensive line of asbestos goods. This company was the pioneer in the development of asbestos in the arts and originated many of its uses. The company showed as specially interesting to those having charge of electric plants asbestos transite doors to be placed in front of transformers, asbestos transite controller linings. The well-known "Noark" enclosed fuses, various forms of electric car heaters, service and subway boxes, trolley wheels and brass goods as well as the various articles in the way of overhead material were also exhibited.

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Messrs. Robert E. Sheldon and E. K. Stewart of the Columbus Railway & Light Company, and Frank A. Davis and H. M Daugherty, of the Scioto Traction Company, on Thursday entertained a party of about 50 ladies and gentlemen at an informal luncheon at the Arlington Country Club. A special car left the loop at the southwest corner of the exhibition grounds at 12:30 o'clock, taking the party to the club. Mr. and Mrs. Amor W. Sharp were among the guests and favored the party with a number of English folk songs and other vocal numbers which were most highly appreciated.

IN THE EXHIBITION HALLS

A gearing that will withstand the wear and tear of heavy city and interurban traffic has long been sought but not until recently, when the R. D. Nuttall Company, of Pittsburg, announced that it had perfected such a gear was it thought possible to make one type that could be recommended to withstand the severest of tests. This company has, however, accomplished this feat and during the convention exhibited at its booth a gear wheel, four feet in diameter designed for use on electric locomotives, which attracted the attention of many operating and mechanical railway men. In constructing the gear a cast-steel center, spokes and rim was made and over this was shrunk a steel tire. In the tire were cut the gear teeth which make a very strong and almost undestructable gear. A type of gear similar to the one exhibited is now in use on the cars of the Interborough Rapid Transit Company of New York. The R. D. Nuttall Company has received orders for more than 500 of this type.

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Making blue prints by old-fashioned sunlight frames is rapidly going the way of all things obsolete. Instead we now have the electric blue printing machine for the making of blue prints by electricity, to render the drafting room independent of a "weather permitting" clause. Special attention therefore is claimed by the exhibit of J. H. Wagenhorst & Co., of Youngstown, Ohio, who are showing two of these machines. The Wagenhorst printer consists of a vertical glass cylinder through which an arc lamp of high efficiency is arranged to descend axially. The tracing cloth and paper are held on the exterior surface of the glass, and the light in its descent does the rest. The lowering speed of the lamp is regulated to suit any strength of paper. But the most ingenious feature of the machine is the device for holding in place the tracings and sensitized paper. This consists of a curtain mounted on a roller in a way much like the ordinary window shade, and mounted on wire cables on which it runs. The tracings need then be simply laid on the glass cylinder and the curtain rolled over them. By its weight and tension this holds them in place, smoothes out wrinkles, and gives the perfect contact essential to good printing. Hundreds of these printers have been sold by Wagenhorst & Co., who are making a specialty of this line of apparatus.

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In the exhibit of the Atlas Railway Supply Company in Building 4 can be found many of the railway supplies that this well known company handles. Among the articles on exhibition are the various types of rail joints, the plates and braces for T and girder rails. The Atlas special rail joints designed for raising the cupped or pitted rails often found on double tracks where cars run in one direction are among the many interesting types of devices that may be found in this company's booth. The Atlas switch stand which is self contained and which requires no loose locks to keep it in position is shown. Keys made for use on these switches can be made to fit other switch locks used on any railroad. Mr. J. G. McMichael and D. Thompson, representatives of the firm, are pleased over the large number of interested visitors they had during the convention.

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The exhibit of Allis-Chalmers Company, which occupied 1400 square feet of space, consisted of apparatus used by street railway systems, prominent among which were two Allis-Chalmers railway motors, one of 50-horsepower and the other of 75-horsepower, together with controller and resistance girds; a complete line of Christensen air brake apparatus, now manufactured solely by the Allis-Chalmers Company, stationary and movable blading from an Allis-Chalmers steam turbine; power transformers, both assembled and in various stages of construction; induction motors, potential starters, etc. The air brake apparatus was assembled on a frame similar to the arrangement used on a car, and was put in operation whenever any one wished to see it working. Visitors had a further demonstration of the efficiency of the Christensen air brake in observing the operation of the street railway system of Columbus. Both the local lines and the interurban cars are almost entirely equipped with this apparatus, and the motormen showed that they understood it thoroughly. The induction motors exhibited, although not strictly in the line of street railway apparatus, were a center of attraction and seemed to be greatly admired by the delegates particularly because of their powerful and finished appearance. The steam turbine model also underwent almost constant inspection. Visitors were particularly interested in the method of securing the blading and of protecting its tips by means of a shroud ring—a device that is patented and can be used in this country only by the Allis-Chalmers Company. The exhibit was decorated throughout in green and black, with mission style of furniture, and railings painted to match. Palms and cut flowers were also used to give greater attractiveness to the display. On the walls were hung large framed pictures, illustrating the various types of machinery manufactured by the company, such as steam turbines, reciprocating steam engines, gas engines, hydraulic turbines, condensers, boiler feed pumps, electrical apparatus of various kinds, rock breakers for ballast plants, etc. The exhibit was in charge of C. A. Tupper and 32 other representatives of the company were present.

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The National Carbon Company, of Cleveland, Ohio, was well represented as is usually its custom at the street railway conventions. Sales Manager N. C. Cotabish was ably assisted by three lieutenants from the office: F. D. Kathe, A. G. Summerell and J. F. Kerlin, while from his travelling staff, Messrs. C. W. Wilkins, E. J. Kenny, A. E. Carrier, A. C. Henry and F. H. Murray, were present to give a lecture any minute on the well known Columbia self-lubricating carbon brush.

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Those handsome boxes containing two bottles of choice perfume which were the souvenirs of the Dearborn Drug & Chemical Works, of Chicago, were truly worth while. This company has the reputation of doing things about right.

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Mr. Fred J. Baird, of the Homes Commutator Company, of Cleveland, O., the company that makes "commutators only," had for its souvenir a bill book.

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The United States Electric Signal Company, West Newton, Mass., exhibited a complete working model of its block signal system.

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Perhaps with no material is it more difficult to make an attractive showing than with paints, and varnish. Cans display nothing and cannot speak. For that reason the firm of John W. Masury & Son thought the best way to attract the eye of the visitor would be to display panels showing the seals of the different states decorated in gold with other decorations which serve in a measure to bring back to the memory the old Pullman palace car of a quarter of a century ago. That the idea has been pleasing was evidenced by the compliments paid this firm by the railroad officials visiting the exhibits.

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Additions to the list of exhibitors reported since the publication of the Electric Railway Review for October 18 are as follows:

Homestead Valve Manufacturing Company, Pittsburg, Pa.—Building 6, Section A, Space 5.—Homestead valves. Represented by Charles B. Ault.

United Foundry Company, Boston—Building 6, Section A, Space 18.—Trolley wheels and bushings. Represented by F. Harry Seavey.

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The New York Switch & Crossing Company, of Hoboken, N. J., is showing an anti-straddling tongue switch. It has perfected a self-locking device tongue switch which keeps the tongue with spring tension to either side of its travel, as well as firmly down in its bed, so that when the wheels strike it from either direction there is said to be not the slightest motion.

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The Davis Pressed Steel Company, of Wilmington, Del., has brought to the convention samples of the brake beam for heavy interurban service. The company makes M. C. B. standard and high speed brake beams. The Davis solid truss brake beams are largely used on scteam roads.

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The Victor cast steel car replacer No. 3 and the Perfect pressed steel car replacer No. 2, shown by the U. S. Metal and Manufacturing Company are attracting a great deal of favorable attention. The Victor No. 3 for paved streets is proving a winner.

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One of the new exhibitors is the Flexible Mesh Rail Bond Company of Ypsilanti, Mich. This company is manufacturing mesh solder terminal bonds, the most important features of which are the terminals. The bond is made of thin, flat strips of copper which are held together at the ends by copper wire cloth wrapped around and extended in the form of a stiff flange on one or both sides. The terminal ends become soft and pliable when heated for soldering to the rail. The display which is located in Building No. 4, Section C, Space 11, is in charge of J. G. Clark and J. L. Matson.

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In this day of advanced construction in car houses and the great attention given to fire protection in them the visitor at the convention will be interested in the exhibit of the International Sprinkler Company, of Philadelphia, O. The company's exhibit includes the International dry pipe valve, Evans model alarm valve, International alarm check valve, retarding (variable pressure) Chambers electric alarm and mechanical alarm, high and low tank float, and annunciator. Many automatic sprinklers to operate at different temperatures and as open and outside sprinklers are shown. These devices are installed by the International company and its licensees, the Standard Fire Extinguisher Company, the Kellogg-Mackay-Cameron Company, the Rhode Island Supply & Enginering Company and the W. J. McGuire Company.

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The Globe Ticket Company, of Philadelphia, and the Duplicate Transfer & Rebate Company of the same city, occupy a combination booth in Building No. 1. Here the Globe Ticket Company is showing a general line of tickets, books, transfers and a ticket destroying machine. There are many things of interest about the Pope patent transfers which distinctly indicate the time of day at which they are issued. One of these styles is issued by the conductor by means of a special holder which operates to show the fractional part of the hour. W. C. Pope, vice president; P. C. Snow, manager of sales; R. C. Osman and W. P. Snow are the representatives at the convention. H. N. Brown, general manager, T. C. Cory and Charles Goble are representing the Duplicate Transfer & Rebate Company and are ready to give pointers on ways and means to secure proper inspection service.

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The Duff Manufacturing Company, of Allegheny, Pa., is showing a very complete line of Barrett jacks at its booth in Building No. 1. The company also shows a number of sizes of Duff roller bearing screw jacks. This company recently secured a contract from the Cleveland Electric Railway Company to equip each car with a Barrett automatic lowering jack and has similarly equipped the cars of the Pittsburg Railways Company, the Pittsburg, McKeesport & Connellsville Railway Company and several other roads. Mr. George A. Edgin, eastern manager, with headquarters at No. 26 Cortlandt street, New York City, has charge of the exhibit.

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The Providence car fender, manufactured by the Consolidated Car Fender Company, of Providence, R. I., has been in use so long on so many electric railways, and has been exhibited at conventions for so many years that most of the delegates know it as a reliable device, and appreciate that it is built upon sound mechanical principles. The exhibit of the company is in Building No. 4, where are two models of the Providence fenders, the original "A" and the new "C." While the Providence fender is a projecting fender it is claimed to be the least objectionable of any projecting fender; especially the model C form, because in tight places on crowded streets, a wagon may be run across it with no injury to the fender. Over 18,000 of these fenders are now in use on about 300 roads. A. J. Thornley, general manager and George Hollingsworth are in attendance at the convention.

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Emil Calman & Company, of New York, are represented at the convention by H. Lee Bragg, sales manager. This company manufactures a line of varnishes and japans and makes a specialty of Ohmlac, an imitation for armatures and field coils. They have a neat booth at the north end of Building No. 4.

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An ingenious member of the Crocker-Wheeler selling force has hit upon a method of proving the advantages of one of the patented features of the Crocker-Wheeler standard railway generator. The feature in question is the Crocker-Wheeler parallel movement brush-holder, and this salesman has persuaded a number of users of competitors' machines which had not been giving entire satisfaction, to use Crocker-Wheeler brush-holders on their machines. In every case it is said that the operation of the generators has been noticeably improved.

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The Lumen Bearing Company, of Buffalo, is exhibiting a working model designed to demonstrate a new form of journal bearing, an invention of Mr. E. P. Sharp. The ordinary design of journal bearing when looked at from a side elevation shows the corners rounded so that the lower edge of the side of the bearing is convex, the effect of which is to cause the oil carried up by the rotation of the journal to throw out to the ends of the bearing, (where it is of the least use,) this being the path of least resistance. In the new form of bearing the lower edge of the side is made straight, but on the bearing surface there is cut out a segment from the inner lower edge so that the line of contact of the bearing surface with the journal when viewed in side elevation shows a curved line which is concave towards the bottom. Thus when the rotation of the axle carries the oil up it is received in this pocket formed by cutting away the inner lower edge of the bearing, and the pressure thus resulting from the accumulation of oil in this pocket forces the oil under the bearing. A demonstration of this theory is made with a model journal box in which a vertical hole has been drilled through the bearing so as to tap the oil pocket described near the top. In this model the rotation of the 3-inch journal at a speed less than 40 revolutions a minute is sufficient to cause the oil to overflow through the hole mentioned. This corresponds to a speed of about four miles an hour and it is evident that at higher speed the effctiveness of this device would be considerably increased.

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A special feature of the Lorain Steel Company's exhibit was the improved types of heavy Tongue switch construction. One of these was the switch with a protected heel and another had a pinless tongue and the case of these new types, as in the present standards of tongue switch and mate construction of this company, the structures are solid cast steel with renewable wearing plates extending under entire length of the tongue. Tongues, switches, mates and frogs to accommodate M. C. B. flanges and for use with new 9-inch guard rail weighing 164 pounds per yard were shown as well as different types of steam and street railway crossings, including "P. R. R. Standard" construction (built up with heavy forged knees and continuous filler) hard steel center type with rolled steel in abutting main, riser and easer rails, and the latest and most improved type, the "solid guarantee" steel crossing. Fifty of these last are now in use in Philadelphia and where this type has been adopted as standard on the Philadelphia Rapid Transit Company. Some 70 or more girder (tram and groove) higher slot and guard rails of various design and weight were on exhibition, including the sections which are most generally used by street railway systems throughout the world. Samples of the output of the Welding Department were shown in the shape of electrically welded rail joints, also samples of the "Nicoll's" composite rail joint.

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The Acme Automatic Street Indicating Company, in addition to an interesting exhibit in Building No. 4 at the convention has equipped 20 of the cars on the North & South High Street Line with its device. This machine is automatic and requires no operation by the motorman or the conductor. It is contained in a box 8 inches by 16 inches and 9 inches deep and shows the name of the coming stop or street in the center of the box. The name of the street or stop remains exposed until the street is reached, when that of the succeeding street takes its place and so on to the end of the line when the machine is reversed and returns to the starting point.

* * *

The evolution of headlights for street cars has kept pace with improvement in other respects. The first headlights were small oil lamps that shed light only on the horses. These were followed by reflectors of tin with small incandescent lamps. These was in turn followed by arc lights placed in a box in front of a tin reflector and other headlights have come since. The Crouse-Hinds Company is showing the Imperial arc headlight which is of the utmost service on suburban and interurban roads. The use of an arc light in this field is a necessity; in a measure it takes the place of a bell and whistle. In the Crouse-Hinds device both the incandescent and the arc headlights are combined so that when the arc headlight is not burning the incandescent lamp is lighted. This feature assures a headlight on the car at all times. Under the trade mark name of "Conduits," this company is putting out a fitting for car and car barn wiring to comply with the underwriters' requirements. These are practically joints for conduits and resemble in use unions T's and L's used by steam fitters The Crouse-Hinds Company has patents covering this device fully, and is the only concern in this country making it.

* * *

Two forms of car replacers are shown at this convention by the U. S. Metal & Manufacturing Company, of New York. One of these is the "Perfect" pressed steel car replacer. The weight of these made for interurban and electric railroads is but 55 pounds per set. They will fit any size of rail from 5-inch down. It is claimed to be perfect in its work and a positive preventive of damages to rolling stock. The other is the "Victor" cast steel car replacer. These are designed for use on elevated railroads or where guard rails are used. Another style is for paved streets. Still another style, Victor No. 4, is for use on electric or standard road using rails five inches high or under. The same company is handling the Columbia lock nut. This nut has been thoroughly tested and has been pronounced by all engineers and mechanics who have examined and tested it to be absolutely perfect. For special uses such as on brake rods or moveable points in switches a special nut has been added to those they are now making, known as the Improved Columbia Lock Nut.

* * *

One of the exhibits in Building No. 3 which is attracting a great deal of attention from members of the association as well as general visitors, is the display of the Eclipse Railway Supply Company, of Cleveland, O. This company exhibits two styles of its well-known Eclipse life guard, style C, the type in ordinary use, and the style D, or slide-under fender, designed especially for use on cars operating on congested streets where a projecting fender would not be practical. This latter type of the life guard retains all the life saving features of the style C fender, but is so constructed that on reaching any crowded or congested portions of a city it can readily be pushed entirely out of the way underneath the forward portion of the car, the fender being supported on an iron framework which is very compact and simple. Several mutoscopes showing moving pictures of actual fender-tests of the Eclipse life guards are exhibited and all visitors are treated to the startling exhibition of a man being picked up by the fender on a car moving at speed of 22 miles per hour. This is an attraction which makes the booth a very busy place. Photographs are also on exhibition showing prominent officials of the Toledo Railway & Light Company being picked up by the Eclipse life guard at full speed. This system recently adopted the Eclipse life guard for their cars. This life guard is also in use in a number of large cities throughout the country, among which may be mentioned Cleveland, Los Angeles, Kansas City, Schenectady, Topeka, Steubenville, Akron, Joplin, Sheboygan and East Liverpool. The Eclipse representatives report they are meeting with very good results from the convention, and are pleased with the future outlook for their life guard.

* * *

The General Electric Company is exhibiting a portable air compressor outfit which promises to fill in a most satisfactory manner the demand for such apparatus. It consists of a portable truck with a 4x5 foot platform, with a compressor, governor and gauge mounted on top of the platform while the tanks are located beneath. It is equipped with a portable connecting cable and hose, the entire outfit making a most convenient addition to the equipment of a car barn or repair shop of the electric railroad. The public never tires of watching the fluctuations in the tube of mercury-arc rectifiers which the same company is exhibiting. This device has grown into very general use for charging storage batteries for all purposes, particularly, of course, those for use with automobiles. The increasing use of electric trucks and supply wagons by public service corporations makes this a most timely exhibit at the railway convention. The very considerable interest on the part of railway in the single phase system led the company also to exhibit a complete equipment. Following its policy, however, the company has shown the very latest development in this field which is an adaptation of the Sprague-General Electric multiple unit control system to single phase work. The simplicity of this outfit, which is most complete and flexible, is quite in contrast with the complicated designs exhibited at earlier conventions. The equipment shown is one of those being manufactured on order from the Central Illinois Construction Company.

Another novel and interesting feature of the exhibit is a CP 21 air compressor from which various parts have been so cut out as to permit examination of all the various details of construction of both the electrical and mechanical mechanism.

* * *

You do not have to tread lightly in the booth of the American Safety Tread Company, for these many forms and classes of treads are safe when they are new and safe throughout their whole life. In this exhibit may be found a combination mat of tread and cork carpet the same as is now in use on the New York and Philadelphia subway car vestibules, also lead filled and carborundum-filled treads for car steps, running boards, and vestibules. The company's new running board tread, composed of carborundum, one of a continuous strip on the outer edge of the board and one with carborundum buttons set in the board, is shown. A sample of "Karbolith" cement flooring, the same as used in the floors of the all-steel cars for the New York subway is also exhibited. Henry C. King, treasurer, and J. W. Scott are representing the company.

* * *

Comparatively few people even among railroad men fully realize the very great importance of maintaining a definite brake-cylinder piston travel in order to secure the highest braking efficiency which in these days of high speeds and short time schedule, is absolutely essential. If by any practical means the slack in foundation brake rigging can be regulated, it insures: maximum braking power at all times and not the constantly decreasing braking effort which develops between hand adjustments, and also the elimination of the "human element" in securing such regulation since it is futile to expect accurate results by depending upon a number of individuals at different points even under the most rigid discipline. The American slack adjuster, manufactured and sold by the American Brake Company, St. Louis, Mo., which was exhibited with the Westinghouse Traction Brake Company apparatus, is designed to accomplish these and other valuable results in a manner at once simple, efficient, and practicable, and at only a nominal cost to the user.

* * *

At the booth of the Sterling-Meaker Company, of Newark, N. J., delegates found a variety of supplies to meet their many needs. Here was exhibited the Sterling safety brake, the giant brake, Sterling sand box, Sterling fender and wheel guard. Sterling roller-bearing trolley bases, and a full line of Sterling fare registers, among which were the five modern registers, full geared. There were also register fittings including Sterling patent center operating devices, conductors' punches, and a Donovan circular glass cutter.

THE NEW WALLACE DOUBLE DOOR FIXTURES.

Unusual interest is being manifested over the line of fixtures for operating two doors reciprocally and simultaneously, which is on exhibition in booths 12 and 13, Building No. 4. These fixtures are the invention of Mr. Carl Metterhausen, secretary and treasurer of the Wallace Supply Company, Chicago and New York, and are so manifestly satisfactory that the company is receiving many repeat orders from railway companies and car builders who have adopted them. A full size end frame of a standard closed car, fitted with double doors and a Wallace operating mechanism, is an interesting feature of the exhibit and deserves the attention of all railway men. The salient features claimed for the Wallace fixture in brief are: Ease of operation, simplicity and few parts, compactness and reliability, as there are no intricate or delicate parts to get out of order. Cold drawn racks and drop forged steel pinions, machine cut, do not permit of any lost motion when properly interworking as in the Wallace fixtures, which are so designed by the employment of commercial channel-iron members and assembled in a most ingenious manner as not only to give the whole mechanism maximum strength with minimum weight, but also compactness, being self-contained and easy to apply. The racks are guided between the channels, which also form the track for the supporting rollers.

The hangers are so arranged that the doors can be easily taken down without removing any part of the operating mechanism and there are no disfiguring hanger plates exposed to view, the natural wood finish of the door being left intact. The racks are connected to hangers through slots in such a manner as to make it impossible to get any binding strains upon them.

These fixtures can be used for many other purposes, such as operating gates, elevator doors, etc., and are at present being installed on the elevator doors of the new Beggs building in Columbus.

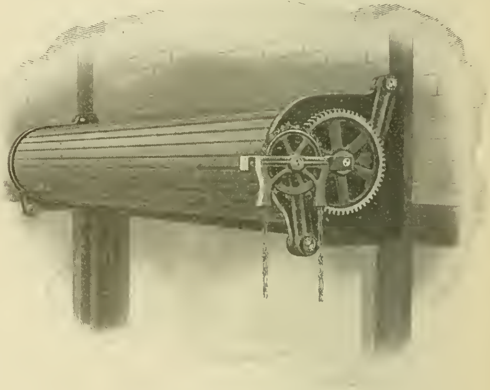
WOOD ROLLING DOORS.

The wooden rolling doors manufactured by the Kinnear Manufacturing Company, of Columbus, O., are constructed with special reference to the requirements of round houses and other buildings where sulphorous fumes prove deleterious to steel work. The value of the Kinnear steel rolling door as a closure for the large openings such as track openings which occur in round houses and similar buildings is so well recognized by railroad engineers and other designing similar buildings that the company has been led to investigate the merits of a door constructed along similar lines but having its curtain proper constructed of some material other than thin steel which would not be susceptible to the chemical action of sulphurous fumes as is steel.

It is well known to engineers that the usual materials of construction least affected by such acidulous gasses are copper, wood and cast iron, where the parts used of the latter material can be made heavy. The company in view of this is now prepared to place upon the market a door for such purposes as above mentioned, constructed practically entirely of the materials named. Steel enters into its construction only in such places as are least exposed to the action of gases and then only in large and heavy parts where its action is unappreciable.

The door is built similar in its general lines and methods of operation to the "Kinnear" steel rolling door. Since the door rolls up at the top of the opening it is entirely out of the way and occupies the least possible space when open. At the same time, the end clearance is so small that a number of doors may be set side by side and yet the ordinary steel post construction between stalls will usually afford ample space on which to mount the grooved guides in which the doors operate.

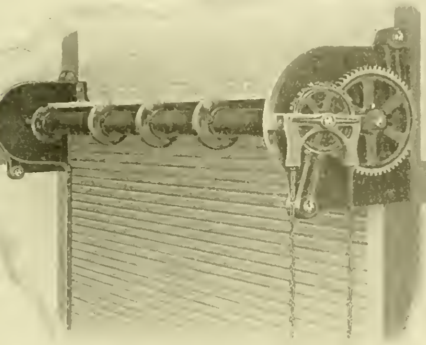
The door is constructed of a curtain proper composed of wood slats strung on phosphor bronze ribbons and running in vertical guides of wood. The curtain is suspended from and rolls upon a barrel consisting of a tube of sufficient diameter to afford absolute stiffness which contains within it the helical springs necessary to counterbalance the weight of the curtain. The whole is supported on brackets of heavy cast iron attached to the upper rear corner of the bracket on the outside by means of heavy pivot pins—and also to the lower outer corner—are two heavy cast iron arms, the upper one extending downward from the top and the lower one extending upward from the bottom. These carry a heavy horizontal arm pivoted at their ends, in the middle of which is a bearing carrying the curtain shaft. The length of this horizontal arm is equal to the horizontal distance between the upper and lower pivot pins of the vertical arms, and thus, through a horizontal slot in the bracket, the curtain shaft may be moved forward or backward a certain distance always moving in a straight horizontal line. On the tube barrel are placed spiral cast iron rings to which the suspending ribbons are attached, so that after the first turn of the slats around the shaft the roll is always circular. On the rear flange of the brackets and behind the curtain proper is carried a pivoted cradle in which operate two rollers. On the bottom of the brackets are suitable curved projections forming a throat which serves to guide the curtain properly down into the groove.



Wood Rolling Door, Open.

It will be seen from this arrangement as illustrated that the curtain hangs in a straight line from the spiral rings down through the throat of the bracket and into the groove. As the door unrolls the shaft moves backward, maintaining the vertical position of the slats, which bear against the rollers on the back flange of the bracket. As the door is rolled up and the diameter of the roll increases, the whole shaft is pushed forward horizontally, being carried by the pivoted arms until the full capacity of the brackets is occupied and the door is fully open. The horizontal arm on one side also carries the hoisting mechanism consisting of gears, sprocket and endles hand chain.

This construction is claimed to form an absolutely sure and efficient method of securing a vertical hang of the slats from the shaft at all times, thereby eliminating wear and the dragging of slats over projections. A space is left between the point of attachment of the ribbons to the spiral rings, and the first slat; this being done to take care of any movement of slats on the ribbon, due to swelling of the wood or other causes. The method of attaching ribbons to the rings is to bend the end of the ribbon around a wooden bar, and bolt through both bar and ribbon, thus putting no direct tearing strain on the thin metal of the ribbon and eliminating sharp bends.



Wood Rolling Door, Closed.

The bottom of the curtain is finished off with a heavy 6-inch wooden bar which forms a bottom stiffener for the curtain and also contains the lower end attachment of the ribbon. This attachment is accomplished by means of slotting the end of the ribbon and bending it back around the head of a T-bolt and rivetting the end to the ribbon again. This T-bolt extends through the bottom bar and carries a long thread by means of which the length of ribbon may be adjusted.

The slats are treated in our shop with a water proofing compound which renders them immune from swelling due to moisture, etc. The curtains are accurately counterbalanced and may easily be operated with speed by one man.

As to durability, it is stated that one of these doors has already been operated over 1,200 times in our shops without showing appreciable wear. This would approximate three years life and would indicate that with ordinary care the doors should last indefinitely.

The manufacturer will be pleased to collaborate with architects or engineers designing buildings, by supplying prints showing the applications of various constructions to their particular needs, giving dimensions, clearance requirements, etc. However, these doors may be applied to old buildings with equal facility.

NATIONAL OIL-PNEUMATIC GOVERNORS.

The function of the type N governor, manufactured by the National Brake & Electric Company, Milwaukee, Wis., is to automatically control the operation of an air compressor driven by a series wound motor, stopping it when a predetermined maximum pressure is reached, and starting it when the pressure falls below a predetermined minimum. The new device is well designed electrically and mechanically.

The fewness and simplicity of the parts, which are also easily reached for repairing, contribute to make the weight of the governor complete, when filled with oil, but 12 pounds. Its lightness and design makes a very convenient size and shape for installation under almost any condition.

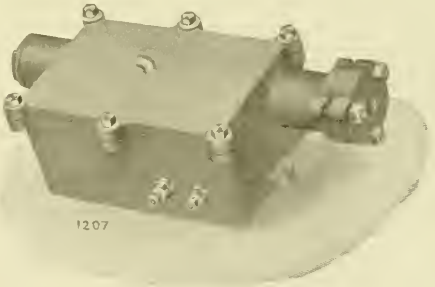
The parts of the governor are enclosed in a containing shell or case the outside dimensions of which are, length 8 inches, width 5 1-2 inches and height 4 inches. The containing case is filled with oil, its capacity being a trifle over a quart. Any good mineral or transformer oil free from organic matter may be used. The oil serves a double purpose, first, it entirely surrounds the working parts and prevents rust, corrosion and wear. Second, it thoroughly suppresses the arc which follows the breaking of the electric circuit, a source of frequent troubles and unreliability in electric pump governors.

Oil possesses very high dielectric properties and suppresses arcing more effectively than any substance or compound yet discovered. Over 16 months of the most severe service of the governor during which time the same oil was used in the case, failed to show the slightest pitting of the contacts. The cost of the oil required for filling the case will not exceed seven cents. There is no deterioration of the oil and it will last for years without replacement.

The containing case is accurately machined to receive a cover which is screwed to lugs on the inside of the case, the joints being packed with a paper gasket. When the cover is screwed in position the governor mechanism is rendered absolutely impervious to grit, dust or water. The design of the containing structure of the governor is such as to permit ready access to the mechanism for adjustment by the proper authorities, but not by unauthorized persons.

The parts of the type N governor consist of an air chamber or cylinder, 1 1-4 inches in diameter provided with double cups made of a material which is impervious to oil. The piston is securely fastened to the piston rod or spindle which carries the springs and adjusting nuts for varying the pressures. The forward end of the piston rod or spindle carries a yoke to which the controlling springs are secured. The cylinder is tapped directly to the reservoir. By an arrangement of a tension spring within a compression spring instead of a single long spring, the length of the governor is reduced considerably. The springs used are of large diameter and heavy wire so that it is impossible for any strains likely to occur to weaken them. The spindle is threaded at its lower end to receive the hexagonal adjusting nuts for varying the range between minimum and maximum pressures.

A rectangular-shaped fork or hammer made of brass, is pivoted on a pin between the adjusting nuts, its function being to trip the switch arm to open and close the electric circuit. The toggle mechanism which actuates the switch-arm is accelerated by the action of an adjustable spring which is supported at one end by a notched brass lever placed in the rear of the switch arm. The other end is secured to the wall of the containing case. This spring is adjustable so as to vary its accelerating action on the toggle mechanism. A small spring with one end secured to the point of support of the switch-arm and the other end to the wall of the containing case prevents vibration of the switch-arm when the circuit is open.

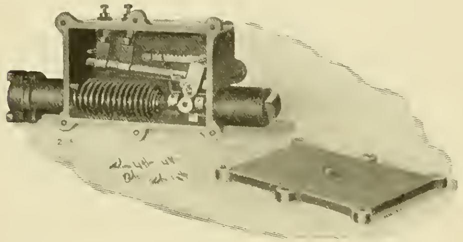


National Oil Pneumatic Governor.

The stationary switch blade contacts are rectangular-shaped and are also made of phosphor bronze. They are insulated from the governor containing case by means of heavy insulation. Short-circuiting between stationary contacts and case is therefore impossible. The arrangement of the supporting screws for the stationary contacts is such that they can be easily turned over to present a new contact for the switch blade if the occasion should ever arise. The two terminals for the electric connections are placed on the side of the containing case, and are thoroughly insulated from the case. The two terminals can be respectively either trolley or motor connection, without in any way affecting the operation of the governor. Hence there is no possibility of making a wrong connection—a feature said not to be included in the design of any other governor.

The terminals are protected from interference and danger of contact by employees and outsiders by means of a rectangular metal cover screwed to the governor case. The leads from the motor circuit are run through insulated holes in the top of the cover.

This governor is adapted for operation by direct or alternating current and its performance is not affected by variations of voltage. When the compressor is operating and the air pressure increases, the force on the piston at once begins to expand the outer or compression spring and compresses the inner or tension spring. As the pressure is increased towards a maximum the upper adjusting nut forces the hammer over its center, causing it, with the assistance of the toggle joint, to deliver a blow to the switch-arm which knocks it out of contact and opens the circuit. The arc which follows is instantly suppressed by the oil.



National Oil Pneumatic Governor with Cover Removed.

When the air has acted on the piston and has been reduced in pressure, the variations in air pressure causes the combination of springs to return the piston to its normal position, thereby moving the hammer over its center in the opposite direction, and causing it to strike the switch-arm and close the circuit. The pressure at which the governor cuts in is regulated by the tension of the springs which are adjusted for the desired pressure by screwing the nuts on the spindle.

RECENT IMPROVEMENTS IN AIR BRAKE PRACTICE.

Great as have been the difficulties to be overcome in reducing the electric motor car to its present state of perfection, an equally knotty problem has been that of equipping these cars and their trailers with brakes which will meet the widely varying conditions of traction road operation. In steam road service stations are always far apart, and extremely accurate stops are not imperative; moreover, these stops are usually made from high speeds, and consequently a very flexible brake is not an essential requirement. Although doing good service in its field, it is clear that the old standard automatic brake is not applicable to traction work. To meet the demands of this service, a brake must be provided to embody not only the features of safety and reliability possessed by the steam road equipment, but also those which will provide for great flexibility of application and release; frequency, accuracy, and smoothness of stops; and a prompt response of all brakes in service as well as in emergency.

The successful and practicable way in which the Westinghouse Traction Brake Company has met all of these requirements is too well known to necessitate comment. Its exhibit at the Columbus convention illustrates clearly the means employed to accomplish these desired results. An important feature of its new automatic systems is the saving of air effected by them.

The rapid recharge of the system after an application of the brakes together with the quick service and graduated release features of all these new schedules are accomplishd by the addition of a few ports to the triple valves, and a skillful arrangement of piping, rather than by the addition of any complicated mechanism. In order to facilitate the installation or removal of various parts, all pipes are connected to brackets to which the valves are bolted, thus requiring no pipe fittings when repairs are necessary, and insuring a great saving of time and labor. General attention has also been attracted to the Westinghouse double-main reservoir system and arrangement of cooling pipe, by means of which dry, cool air is provided for the brake system.

General attention has been called to the Westinghouse Company's new schedules for interurban and elevated roads. Their AMM equipment is claimed to provide braking for trains of from one to five cars, and embodies, not only the features of quick-recharge, quick-service, and graduated-release, but also extreme flexibility in service and yet a high brake-cylinder pressure in emergency. This schedule has a brake valve so designed that it is possible to release the brakes on the motor-car in unison with those on the train; or to hold the brakes on the motor-car while releasing all others, and at the same time to recharge the entire system.

For trains exceeding five cars in length, the Westinghouse schedule known as the AMR is particularly adapted, as it embodies practically all the features of the AMM and in addition has the quick-action feature of the steam road brake.

Still the most interesting of all these equipments is the electro-pneumatic, which is a skillful combination of the latest improvements in automatic air brakes, together with two magnet valves which furnish a straight air application and release on every car in the train, regardless of its length. This is accomplished without interfering with the automatic brake, which is operated by the same brake valve with no complication of position or parts. This system gives the most satisfactory operation in service, not only because of its extreme flexibility and simultaneous action, but also because of the great saving of air, resulting from the fact that while applying and releasing the brakes by aid of the magnet valves there is no variation of brake pipe pressure. This saving is said to amount on an average to 46 per cent over the standard two-application stop, or 19 per cent over the one-application stop, the latter being the most economical one possible with a simple automatic brake. In addition to these features, in case of any break in the electric circuit or accident to that part of the apparatus there is always at hand a flexible pneumatic control with its emergency feature in reserve at all times.

Among the novelties which the Lumen Bearing Company is exhibiting at this convention is its Ideal Trolley wheel with drop forged copper center. The construction of the Ideal wheel is so well known as to require no special description. In the new design referred to the copper center is cast 9-16 inch thick and is then forged under a 500-pound hammer and reduced to 1-2 inch in thickness. The bearing face of the wheel is then turned and by reason of the forging process this presents a wearing surface of greater density and toughness than is to be expected with a casting. The Lumen Bearing Company has recently acquired the McKenna patents which provide for covering the inner surface of steel flanges of the Ideal wheel with copper. This is to meet the objections of those who believe that steel in contact with trolley wire wears the latter more rapidly than in the case of the copper wheel.

Electric Railway Review

PUBLISHED MONTHLY BY THE WILSON COMPANY, CHICAGO

NEW YORK: 150 Nassau Street CHICAGO: 1660 Monadnock Block PITTSBURG: 510 Frick Building

Subscription Price, $1; Foreign, $3; Single Numbers, 10 cents

Entered at the Post-Office, Chicago, Ill., as Second-class Matter

VOL. XVI NOVEMBER, 1906 NO. 11

President Ely and the Accountants.

Special attention should be called to the address made at the opening session of the American Street and Interurban Railway Accountants' Association October 16, 1906, by Hon. W. Caryl Ely, president of the American Street and Interurban Railway Association. This address, which deals largely with the subject of depreciation, will be found on another page of this issue. Mr. Ely's remarks in this connection are important, not only because he is now and for years has been at the head of important electric railway properties, but because at the time he spoke he was also at the head of the national association of electric railways. In expressing approval of the discussion which was to be had by the Accountants' association, he cited it as the best evidence that this association had a spirit of progressive intelligence and an understanding of the present situation.

Jurisdiction Over Ohio City Lines.

The question has been raised and discussed at some length in the daily press of the state, as to whether the Ohio railroad commission has jurisdiction over the city street railway lines. The powers of the commission were recently extended to include electric railways, and it was clearly the intention of the legislature at that time to exempt city lines from the operation of the law. However, in the opinion of the lawyers who have studied the act creating the commission, the very clause which was intended for this purpose, by its lack of definite specifications, by implication gives the commission control over these lines. The clause referred to reads as follows: "This act shall not apply to street and electric railways engaged solely in the transportation of passengers within the limits of cities." Practically all of the large city street railway systems have lines running outside of the city limits and nearly all are engaged in the transportation of United States mail, while many of them handle package freight, and are thus clearly not "engaged solely in the transportation of passengers within the limits of cities." Therefore, there is considerable reason for the belief held in some quarters that the commission may be obliged to include these systems in its jurisdiction. The commission now has inspectors in the field examining the property of the electric roads, and it is probable that this question will be required to be decided at no very distant time.

Municipal Tramways Association.

The report of the meeting of the Municipal Tramways Association held at Leeds, England, September 19 to 21 last, indicates that municipal ownership has some disadvantages when considered from the standpoint of the manager, who is responsible for results. The conditions obtaining in Great Britain, where we have often been assured men of far greater ability are chosen for councilmen than is the case here, indicates that no great reform might be expected in America were the campaign for municipal ownership here to be successful. The municipal tramways have to defend themselves against the other departments of the municipal government and they find that in conducting on a business basis what should be a business enterprise, the privately owned tramways are desirable allies. In his presidential address, Mr. J. B. Hamilton, general manager of the Leeds Corporation Tramways, suggests the desirability of a union of the Municipal Tramways Association with the Tramways and Light Railways Association and the Tramways and Light Railways Officials' Association on the ground that the interests of all three are for all practical purposes identical, and that joint action should be taken to guard against oppressive or harassing legislation or regulations. Other points regarding the policy which the tramway committees of the municipalities should follow were touched upon in a paper by Mr. R. A. Smithson, a member of the Leeds Corporation Tramways committee.

Politics and Labor.

Some tramways committees have encountered difficulties because of the geographical method followed in naming the members, that is giving each ward a representative. Also, it is difficult to get men of business capacity and of a high standard of education to go through the turmoil of election and if elected, to give the necessary time to the public business. Mr. Smithson dilated on the evils of little "caves" formed by ward representatives for the purpose of getting extensions of tramway lines in their respective wards. "Cave" seems to be British for "lobby," or we might more aptly express it, combination to promote "log rolling." And these caves are said to be especially difficult to withstand about election time. This indicates that even abroad municipal legislators are not incorruptible. From Mr. Smithson's paper it is to be inferred that it has been found difficult to prevent the granting of special favors to special localities, and that politics is permitted to play far too great a part in tramway management. The case of the London County Council tramways carrying workmen at fares which are admittedly less than the cars can be operated for is cited as an instance of injustice to the inhabitants in general. Also municipal ownership has not proved in Great Britain to be that panacea for labor troubles which many in this country affect to believe. The labor question is found to involve a good many complications because of the tendency of members of the council to interfere in all disputes, making it extremely difficult for the manager, who should be held responsible for the discipline of employes.

Questions as to Profits.

Mr. Smithson also discusses the question of whether a municipal tramway system should be operated with a view to making a profit, or of attempting to balance the receipts and expenditures. His own opinion is that the policy should be such as to insure the enterprise being entirely self-supporting, saying that philanthropy at the expense of the ratepayers must be strictly avoided. He adds: "A certain amount of missionary work may be necessary or permissible in some localities. Missionaries have achieved many noble results, but we must remember that many have only succeeded in pleasing the palates of the natives." It will be observed that Mr. Smithson's theory is entirely at variance with that of some of the American advocates of municipal ownership, who promise all kinds of things. What should be done with the profits of a municipally operated tramway, when there are any, is another important point. In the case of Reading, the council had decided that until the tramways committee had accumulated a surplus of £30,000 nothing should be advanced to the city for reduction of taxes. One of the representatives of Glasgow deprecated large contributions to the city treasury on the ground that experience had shown that the city was always extravagant in the spending of such funds, looking upon them as wind-falls and not as means of reducing the ordinary taxes. Some of the tramways committees are not so fortunate as to have to consider what to do with profits and one committeeman complains that all paving and maintenance of roads is charged against the tramways department, apparently on the theory that the tramways department should be treated as a milch cow, and having borne all its own expense, should feed the family besides.

Prospects of Harmony in Chicago.

After years of bitter controversy, endless discussion and costly litigation, the end of the Chicago street railway problem is in sight. Both sides have long been weary of the dispute and have at last become sufficiently imbued with the spirit of compromise to get together on an ordinance which promises not only to restore harmony between the city and the traction companies, but also to give Chicago what she has long demanded in vain, a street-car service adequate to the needs of a large city. In the terms of the "general settlement" ordinance, of which an outline is given on another page of this issue, it seems as if common ground has been reached at last, and prospects appear very bright for an agreement at no very distant date which will be hailed with delight by the long-suffering traveling public of Chicago. In the ordinance now under consideration in the local transportation committee the "immediate municipal ownership" bugbear has, to a great extent, at least, been dropped from sight in the interests of a speedy settlement, although careful provision is made for purchase of the street railways by the city at any time when such a radical step may be deemed desirable and feasible. Moreover, if the other features of the plan are carried out, the cry for municipal ownership is likely to sink deeper and deeper into oblivion, as the conditions which have brought it forth, namely, poor service and friction between the companies and the municipality, are removed.

Six-for-a-Quarter Tickets in Philadelphia.

The Philadelphia Rapid Transit Company on August 1, began selling six tickets for 25 cents. The company has since the formation of the Union Traction Company, in 1895, sold "exchange" tickets good over intersecting lines for 3 cents in addition to the cash fare of 5 cents. It has also issued some free transfers. The exchange ticket arrangement was not altered when the new tickets were adopted and the number of free transfer points has been increased rather than decreased since August 1. The popularity of the six-for-a-quarter ticket is apparently to be inferred from the fact that 350,000 more passengers were carried during September of this year than in September, 1905. The average rate per passenger on this system has gradually decreased in recent years; in 1897 it was 4.55 cents; in 1905, 4.01 cents; and in 1906, 3.9 cents per passenger. It is estimated that the average rate this year will be about 3.7 cents. This reduction is partly accounted for by the increase in free transfer points in outlying districts. It has been suggested that the new six-for-a-quarter tickets, amounting as they do to a fare of 4.16 cents, will give the company a better rate than the exchange ticket arrangement, which gives persons using the 3-cent transfers an average fare of 4 cents, but it is forgotten that the new 4.16 cents tickets also will be available for persons not wishing to transfer and who under the exchange ticket plan would pay 5 cents for the initial ride. The revenue which the company will derive as interest on the money invested in tickets will not be an impressive item.

Joint Electric and Steam Line Tariff.

The Chicago & Milwaukee Electric Railroad Company tariff I. C. C. No. 2, made effective on November 4, is probably the first joint steam and electric line freight tariff in the middle states and should offer a suggestion and argument to those electric lines which have been endeavoring to obtain prorating agreements with the steam roads. The tariff is agreed to by the Chicago & Milwaukee Electric, Elgin Joliet & Eastern, Illinois Central and Yazoo & Mississippi Valley and applies to cabbage in carload lots from Racine and other Wisconsin points to New Orleans, Vicksburg, Natchez and Memphis. The Illinois Central has agreed to extend this joint tariff by increasing the points of destination to include all points on the Yazoo & Mississippi Valley and Illinois Central in the lower Mississippi valley to which business is offered. Tariffs for this purpose will be made effective as fast as the traffic demands, under the ruling of the Interstate Commerce Commission that in case of a new line the thirty days' notice provision of the law may be waived and the tariffs be made effective at once by merely posting and notifying the commission. This is not a switching but a prorating arrangement. The division of the earnings is on the basis of a certain percentage of the rate per hundred pounds and is identical with the division which competing steam roads have hitherto enjoyed. The joint rates apply to a territory where the electric line has strong competition from steam roads and not to a territory where the electric road is entirely responsible for the development of the traffic. The arrangement points effectively to what may be accomplished by persistent effort.

Italian Railway Progress.

Experience with electric railways in Italy has been so favorable that it is now proposed to make a more extended use of this source of power and instead of replacing the old rolling stock with new locomotives in some regions, the lines will be operated by electricity. During the past three years 260 miles of real electric railways have been operated in Italy—the Milan-Gallarate-Varese line, 80 miles, which is operated by the third rail, and the Valtellina with 65 miles of electric line using overhead conductors. For the Milan system waterpower is obtained from the River Adda, where for three miles from Desco there is a difference of level of 98 feet and 10,000 horsepower is available. It is now proposed to convert to electric operation the Italian lines which enter at Novara in the northern part of the country and the minister of public works has been instructed to construct a hydraulic plant for generating electric power. In this work the water of the Lessin will be utilized and about 7,500 kilowatts will be obtained from this source. A large dam will be placed across the river leading to a canal 12 miles long, which runs to the turbine house. This will also supply water for the intersecting Cavour canal, which is used for irrigation. In providing funds for this work Italy is not disposed to increase its debt, but looks with favor upon private initiative and is willing to grant subventions or subsidies based upon the mileage built and operated. These government subventions are regarded as safe and accepted by the Italian banks as good security. As a field for the investment of foreign capital, the conversion of electric operation of railroads in Italy would appear to offer greater inducements than in Mexico. The opportunity for the development of traffic is greater, and the high character and great ability of the ministry of finance which is now directing the railroad programme should be more assuring.

Locating Lightning Arresters.

The problem of the most effective distribution of lightning arresters for trolley circuits is one that cannot be solved by any fixed rules owing to the extremely erratic nature of the force dealt with. It is only by noting the localities most frequently visited by lightning discharges that a practical solution can be reached. Mr. H. H. Adams, of the United Railways & Electric Company, of Baltimore, Md., has devised a novel and effective means for locating spots where lightning seems to strike most often. He is not a believer in the old adage that lightning never strikes twice in the same place for he has found the contrary to be true. In his office Mr. Adams has a map of the United's system. Whenever a crew reports that a car has been struck at a certain point on the line Mr. Adams sticks a pin in the corresponding point on the map. It is interesting to observe how these pin holes seem to group together and when a number of discharges have occurred in one locality an arrester is installed there. The use of this method of recording discharges shows that curves and junctions are the most vulnerable points.

Testing Bearing Metal.

The master mechanic of an important city system recently found that with the increase in the prices of pig metals entering into the composition of armature bearing metal, there was a falling off in the quality of certain metals, as compared with that supplied on former orders for the same thing, and it was desired to have some method of inspection that would permit the quality of the metal to be checked at the time of delivery. There was rigged up in the shop a drop-testing machine of simple construction in which the bars of bearing metal are subjected to an impact test. The bars as received from the manufacturer are about one by two inches in cross-section. Bars selected at random from a shipment are supported across two 1¼-inch square bars, placed 4 inches apart, and a similar 1¼-inch square bar is placed above the test bar at the center of the span to receive the weight, which is a ball weighing about 15 pounds provided with wings moving between vertical standards. Bars of metal taken from lots that had proved satisfactory in service stood from 8 to 10 blows of the 15-pound weight falling from a height of 5 inches, and when new lots of bearing metal are received which fail to meet this test they are returned. This test was adopted on the theory that if two metals purporting to be of similar mixtures behaved in the same manner under the drop test, they would probably give similar results when cast into bearings. The fact that the test has been found of value is suggestive of the desirability of farther investigations along the same line with the object of formulating specifications for this class of material.

Depreciation in Great Britain.

On another page will be found a paper presented at the fifth annual conference of the Municipal Tramways Association held at Leeds, England, in September last, in which Mr. G. W. Holford, general manager of the Salford Corporation Tramways, discusses "Depreciation and Renewals Funds in Relation to Tramways Undertakings." With this we also give an abstract of the discussion which the paper elicited, as a number of points were brought out which should be of special interest to the managers and accounting officers of American electric railway properties. In taking up the question Mr. Holford assumes that the original installation was made with borrowed money and that inasmuch as the life of rolling stock, buildings and overhead equipment, if the ordinary maintenance is properly done, is greater than the term in which the Board of Trade stipulates that loans shall be repaid, no provision for depreciation on this equipment need be made. But with track and permanent way, the life of which is shorter than the life of the loan, provision for rebuilding and replacing track must be made in the shape of depreciation or renewal funds. Preliminary to determining what provision is requisite, there were collected data from continental tramways as to the probable life of tracks, which may be summarized as ten years under heavy traffic and fifteen years where traffic is fairly light, that is, cars not oftener than once in five minutes. Based upon his experience the author considers that £400 per mile per annum should be set aside to replace track having an estimated life of ten years, and £267 per mile per annum for track with an estimated life of fifteen years.

Function of the Sinking Fund.

In the discussion of the subject it transpired that there existed some difference of opinion as to the amount which should be set aside for track renewals and also as to the theory on which such funds should be provided, there being confusion in the minds of some speakers as to the proper scope of the sinking fund. If it be assumed that a railway is always to be operated on borrowed money, then it is sufficient if the debt be repaid by the time the physical property is worn out, and new money can be borrowed to rebuild the plant. Mr. James Dalrymple, of Glasgow, urges that this is not the proper theory and that any municipal corporation should conduct its business just as should an individual. It must free itself from debt before the business belongs to it, and, therefore, depreciation is a necessary charge quite aside from payments to the sinking fund. Those who discussed the paper for the most part were of the opinion that the important question is not the amount that a railway can afford to set aside for depreciation but the amount that is necessary to be put aside in order to insure the undertaking being on a sound financial basis. In other words, if the undertaking were not giving satisfactory returns, then the fact should be recognized and the proper remedy applied.

Maintenance Versus Renewals.

In opposition to depreciation funds it was argued that all necessary was being done if the cost of maintenance were charged to revenue. This point has been discussed to some extent by the accountants of street railways in this country. In his annual address before the Accountants' association at the Saratoga convention of 1903, Mr. H. J. Davies showed the fallacy of attempting to care for depreciation by this method. The argument which he presented there might with advantage be elaborated in an attempt to clear up some of the misapprehension that exists. For example, it may be assumed that the rail has a life of ten years under heavy traffic, and that when the rail is worn out there has been ⅝ inch of metal worn off the top, an average of 1-16 inch per year. Even if the track is perfectly maintained, joints, bonds, etc., repaired or replaced as defects develop and everything possible done to keep the track in a good condition, yet at the end of five years the rails are half worn out. The 5-16 inch of metal that has been removed cannot be restored gradually and is not replaced by the ordinary maintenance. At the end of the ten years in addition to the normal maintenance expenses there will have to be met the extraordinary renewal expense, and it is these extraordinary expenses that require the provision of depreciation or renewal funds, no matter what may have been done in the way of maintenance. Ties have to be similarly considered, and an indefinite number of other examples could be cited. How the details of such provision for depreciation should be handled is a matter of detail that is unimportant as compared with recognition of the principle that renewals are not included in maintenance, in the ordinary meaning of that term.

British Municipal Practice.

One feature of Mr. Holford's paper is the compilation showing just what, if anything, the municipal tramways managements have done and are doing in the way of caring for depreciation. It is apparent that too many of them under the plea of poverty have declined to face the conditions and have put off the day of reckoning. The author calls attention to one undertaking (Wallasey) in which the appropriation to the depreciation and renewals fund is based upon the car-mileage, and by inference, disapproves of this method. The use of this basis in apportioning depreciation charges has the advantage of distributing the charges in proportion to the earnings. That is, presumably the month wherein the greatest number of car-miles is run is also the month when receipts are greatest, and therefore, from the operating standpoint it may be desirable to have the greatest charges made at the times the earnings are greatest. Also, much of the depreciation depends to a considerable extent upon the mileage made by the cars. However, unless there is considerable experience available in determining the charge per car-mile, errors could easily be made in providing too much or too little per unit.

MUTUAL TRACTION INSURANCE.

The Committee on Insurance of the American Street and Interurban Railway Association concluded its report at the Columbus convention with the statement that, in its opinion, all the members of the association might be profitably consolidated into one insurance company to the extent, at least, of the insurance of their properties against destruction or damage by fire. The idea of a mutual traction insurance company has been frequently discussed heretofore and is worthy of further consideration. A similar plan, which was originally proposed by Mr. Henry N. Staats, of Cleveland, has already been partially carried out by the organization, under the laws of Ohio, of the American Street Railway Insurance Company, with a capital stock of $500,000 and a surplus of an equal amount. Twenty-four electric railway companies have subscribed for the stock and the company is now prepared to write insurance on a portion of the property of the companies represented, at actual cost, all excess of premiums over losses and expenses to be returned at the end of the year.

While the immediate purpose of this company is only to force a recognition in the matter of rates from the old-line insurance companies, which have hitherto held the traction companies practically at their mercy, lowering rates when competition made it expedient and correspondingly raising them again as soon as the temporary exigency was removed, there is no valid reason why this idea should not be carried to its logical conclusion and a company formed with sufficient resources to carry the entire insurance of the companies that may subscribe to it. It is not possible for every company to do as the Philadelphia Rapid Transit Company, the Pennsylvania Railroad and others have done, and carry its own insurance, but it is possible for a number of companies, if not all of those in the association, to band together for this purpose. Such a company would, of course, maintain an adequate inspection department to see that each member took all proper precautions to protect its own property, and would thus be subject to a much smaller percentage of loss than companies insuring all classes of risks. Traction properties are isolated risks and are not subject to the possibility of such large losses at one conflagration as other kinds of property. Moreover, such a company would be relieved of the expense of agents' commissions, which are a total loss to the insured. That the present rates paid for fire insurance are entirely too high is shown by the results of a letter canvass conducted by Mr. H. J. Davies, chairman of the "Insurance" committee, which was presented at the Philadelphia convention a year ago. He received replies to his letters from 420 railways, showing that the actual fire loss amounted to only 27.66 per cent of the premiums paid. Under the mutual plan this excess would all return to the companies, who would thus have a still greater incentive for protecting their property against fire, which is, after all, the main thing to be desired.

THE TRAFFIC CAPACITY OF TERMINALS.

At the present time the proportion of terminal to total track mileage on the electric railways of this country is a percentage of insignificant proportions in comparison with the figures applying to steam railway practice. We are a long distance away from the day when for every four miles of road, computing double track on the basis of actual distance covered, there is used one mile of switching or terminal track. Nevertheless, the extension of electricity to steam railway operation and the growth of the freight business on electric systems are both bringing the terminal question more and more to the front. Already a considerable number of interurban railways pass their cars through terminals of some sort or other at the ends of routes in large cities of the middle west; the rapid transit systems of our metropolitan communities are face to face with the terminal problem, whether they recognize it as such or not; and the need of standardizing the trolley express business is leading the promoters of such enterprises to serious consideration of the ways and means of handling traffic at the ends of lines, divisions or districts.

To discuss the terminal problem in detail would require a small volume, but there are a number of points which will bear special emphasis at this time with reference to electric railway conditions. Broadly speaking, a railroad terminal includes all the facilities which a company provides for the transaction of its business at the end of any given section of its trackage, so that the movement of cars and the methods of handling passengers and freight must both be considered in trying to determine the best equipment and operating arrangements in any specific case. On the electric road the passenger traffic is paramount, so that the first consideration must be its free and unobstructed movement, even at the expense of delays to the movement of cars handling light freight and express. It is probable that as the usefulness of the electric road in carrying light freight is more and more recognized, there will be a more general operation of freight cars over trolley lines at night, especially in connection with suburban and rural shipments. Some provision for handling freight ought to be included in the design of every electric railway terminal where the conditions indicate business of this character in the near future.

Separation of incoming from outgoing traffic is the key to successful operation in all terminal stations, and of almost equal importance is the clearing of the main-line tracks from yards and any special fouling movements. In elevated train service and in the operation of multiple-unit cars in yards connected with subways or other rapid transit routes, it is especially important that movements of trains into and out of yards shall be made quickly. On one or two-minute interval service it is almost impossible to back a train into a terminal upon the main line against traffic without holding up the following trains, even if a gap of an extra minute exists between the last outgoing train and the insertion of the extra in the schedule. Steam railroads take great care to foul the main line as little as possible in yard movements, but on short-interval rapid-transit electric systems the requirements are fully as severe, even though there are no long trains of heavy freight cars to be handled in the latter case. To obviate delays the main line through any terminal should be treated as high-speed trackage, even though the movement of cars over it be at slow speeds. Even the blocking of a slow-speed train on a terminal track may paralyze traffic on approaches to the complete temporary demoralization of the service. It is an excellent plan in laying out a terminal to include one or two side tracks upon which disabled cars may be run, and it should be possible in most cases to provide at least an inspection pit under one of the tracks. The pit can be covered with special planking in city surface loop terminals to prevent the public from falling into it, in case such a removable covering appears desirable.

As far as is possible cars should move through a terminal in one direction only, from loading to unloading points. The mileage caused by reverse movements, cost of starting and stopping cars and the wear and tear imposed by back and forth switching, are certain to amount to no inconsiderable figures in the course of a year's business. It has been clearly shown that stub tracks cannot compete with loops, other things being equal, in the volume of traffic handled on a given headway. Storage tracks focusing on a loop enable spare trains or cars to be rushed quickly into service in time of need, and the storage advantage of stub ends in a terminal is easily offset by treating the loop with its connections as something more than a way track. The larger the traffic the more it will be profitable to secure forward movement of the rolling stock under all conditions either by additional tracks or by improvements in interlock and signal equipment. In any terminal where manual operation of signals plays the controlling part in the train or car movements, prompt work on the signals and switches is of immense importance, especially in rush hours. Alert service by switchmen at street junctions and prompt handling of controllers by motormen on passing electric track circuit switches, are vitally essential to the expeditious handling of large traffic both in and when approaching terminals. To pass the maximum traffic through a terminal which may be a single loop around a city square, or a complicated network of tracks, interlocking yards and special platforms, the car service must be adequate to carry away a constant stream of passengers in at least one direction, if not in two.

The arrangements for handling passengers and freight in congested terminals are quite as important as the physical equipment provided to facilitate rolling-stock movement. Experience in the past few years has pretty well shown the need of keeping opposing streams of travel apart in terminal stations; of allowing plenty of platform room, broad stairways and enough ticket offices to permit a steady influx of passengers without causing long delays. On the street surface it is very difficult to control the volume of traffic offering itself for transportation, but double stops on loops with specially marked berths for the cars and clearly announced destinations, will do much toward lessening congestion. Incoming and outgoing freight should be carefully separated, even in electric railway terminals, for such a classification made in the early stages of trolley freight handling will save a vast amount of confusion and trouble as the business grows.

The traffic capacity of any given terminal may be expressed in terms of rolling stock movement through it in a given time, or in passengers and freight handled. From the operating standpoint the car movement is the index of the situation, but with a broad outlook one must see that all the facilities offered supplement each other under full-load conditions. Anything which saves time and car mileage, which reduces congestion and shortens distances traversed by either passengers or freight, works toward the increase of terminal traffic capacity. The point of view of steam railroad experience is none too broad for the electric railway man who sees the time coming when trolley terminals will be potent factors in the transportation problems of electric systems. There is much to learn from steam railroad practice, in endeavoring to avoid mistakes in handling bunched traffic on the newer trolley lines.

SMOKE PREVENTION IN POWER PLANTS.

The prevention of smoke in modern power plants is sometimes considered to be a problem of greater interest to the general public than to the chief motive power engineer of an electric railway system, but the tendency toward greater and greater refinement in power house operation and the increased consideration given by public service corporations to the broad effects of their methods upon the temper of their respective communities warrants reference to this matter.

In a nutshell, the complete prevention of smoke can only be obtained by securing perfect combustion. Every experiment on boiler furnaces, fans, grates and stacks must be directed toward this end. It is out of the question to burn hard coal in the great majority of railway plants, but the smoke inseparable from the use of soft coal can be reduced, under proper conditions of installation and operation, to the emission of gray smoke for very short periods at intervals of a number of hours.

Large boiler capacity, the proper burning of coal on the grates, uniform stoking without poking or breaking up of fires, and the interest of the man in charge in preventing smoke, are all essential. Lack of boiler capacity makes it necessary to drive the boilers above their normal horsepower, commonly done by poking the fires, and this process invariably produces smoke. The chimney of a railway plant may be free from smoke for long periods, when a few thrusts of an iron into the fire will immediately be indicated by dense volumes of black smoke at the chimney top. In such a plant the tremendous peaks and sudden changes which occur in the loads often make the installation of sufficient boiler capacity to keep the output of each boiler low at all times impracticable. The larger the plant the more moderate will be the load changes in relation to the forcing of individual boilers, which is a condition making for ultimate economy, since boilers run more efficiently and deteriorate less when operated without forcing.

To obtain the second essential condition, uniform stoking, without poking or breaking up the fires, is less simple. Skilled firemen are valuable in this connection, but cannot always be depended upon. Automatic stokers will effect uniform feeding of the fuel upon the grates, but will not alone prevent the necessity of a considerable poking of the fires. Stokers applied to boilers which are not too small for the load they are to carry reduce the amount of poking necessary, but a certain amount of poking of fires can scarcely be avoided. A forced draft system in connection with stokers will almost entirely obviate the poking of fires except at the time of cleaning, which generally need occur but once a day. By changing the power of the draft the fires may be brightened up and more work obtained from the boilers to meet changes in load.

In a paper on smoke prevention read by Mr. A. Bement before the Western Society of Engineers, the author summed up the situation as follows:

"It is a recognized fact that bituminous coal can be burned without smoke; also that the consumption of the volatile gases results in increased economy, and while great improvement has been made, there is very much still to be accomplished, and the great and foremost requirement is a technical one, demanding not only a recognition of the principles involved in smokeless combustion, but better engineering practice as affecting design of plants and furnace apparatus."

Careful study of the combustion conditions in individual plants is an essential in all such reductions of smoke difficulties.

THE COLUMBUS CONVENTIONS.

In the first of the daily editions of the Electric Railway Review published on occasion of the Columbus conventions, some emphasis was laid upon the fact that at the 1906 meeting the American Street and Interurban Railway Association was on trial insofar as the success of the reorganization scheme which had been carried out was concerned. As regards the membership of the association and, therefore, to a considerable extent, its influence and its sphere of action, the reorganization is undoubtedly a success, the membership having increased 50 per cent since the Philadelphia convention. Much remains to be done in this direction, however, because the membership even now comprises only about one-fourth of the operating companies.

The wisdom of the plans of the present organization that affect the three affiliated associations of accountants, engineers and claim agents, has also been demonstrated. The departmental associations have been relieved from the necessity of themselves providing the required revenue; their membership has been increased, since all of the companies members of the American association are members also of the others; also there has been no decrease in interest shown by the men most active in the departmental associations, and at the Columbus conventions the work of the accountants, the engineers and the claim agents, both in subject matter and in the methods of handling it, was all that reasonably could be desired. The increased activity such as obtained was naturally to be expected in the case of the Engineering and Claim Agents' associations since those bodies are comparatively young in years. The way in which those best qualified to judge regarded the Columbus meeting of the Accountants' is indicated by the fact that heretofore the accountants have been accustomed to say: "This is the best convention since the organization meeting at Cleveland." This year they omit the qualifying phrase and are agreed that the high-water mark was reached.

So much cannot be said, however, for the convention of the American association. While the programme arranged for the 1906 meeting was longer and more comprehensive than ever before, it was to be remarked that with very few exceptions the authors of the papers presented and the active members of the committees which submitted reports, were men who, prior to the reorganization, would not have been prominently identified with the American association. They are men active in one of the national departmental associations or in the state associations or engaged in consulting engineering work, and with the exceptions noted are not numbered among the presidents and managers who might be expected to be the most active and influential representatives of electric railways in the parent national association.

The meetings of the American association were notable for the same scant discussion of papers which in former years was the cause of much adverse criticism. Thus, at the Wednesday afternoon session when committee reports were considered, only one provoked discussion. On the next day at the morning session four out of five papers presented elicited no discussion. Thursday afternoon no discussion was had on any of the four papers read. Another way of stating the same thing is to say that exclusive of the presidential address, addresses of welcome and other business of similar nature that is incident to the opening session of an association of this character, to report the proceedings of the American association required less than eleven pages of the Electric Railway Review, whereas for the report of the Engineering association, which had only half as long a programme, there were needed nearly thirteen pages. These figures are, of course, exclusive of the papers and committee reports.

We believe that the principal reason for this unsatisfactory condition as regards discussion of papers and reports presented before the American association, lies in the fact that the presidents and managers of electric railways—the men who are charged with the determination of broad questions of policy and who are the natural and proper representatives of their respective companies in the association—are not willing to discuss in public those questions of policy in which they are most vitally interested. Secondary to this is the fact that because of their time being taken with such questions of policy they have not the accurate knowledge of technical matters which would make it desirable or practical for them to attempt the discussion of the subjects which for years past have been chosen for convention papers. This criticism of the work of the American association is by no means a new one; if the need for it is to be obviated it would seem to be the proper thing for the presidents and managers to choose for their programme those subjects which they really wish to discuss, and if necessary have all the meetings of the American association executive sessions, confiding to the departmental associations the consideration of most of those matters which heretofore have been brought before the parent body.

THE DRAWBRIDGE ACCIDENT AT ATLANTIC CITY.

It is unfortunate that the description of the equipment of the West Jersey & Seashore electric railway in this issue must be associated so soon after the opening of this new line, with one of the worst accidents in the history of railroads. The line was changed to be operated by electricity at an expense of six million dollars, and the signal equipment and safety appliances used were the best obtainable. The disaster at the drawbridge near Atlantic City on October 28 resulted in the death of 64 persons. The train of three cars was derailed and plunged into deep water, so that two of the cars were completely submerged and most of the passengers in them were drowned. Thus far no explanation of the cause of the accident has been furnished by the railroad company, but in a statement issued by it the claim is made that the bridge was properly closed and locked with rails in alignment. The testimony before the coroner's jury brought out the fact that some trouble had been experienced with the rails at the lock and it was sometimes necessary to force them into position. It was also possible for the rails to be slightly out of place without interfering with the semaphore signals showing a clear track. The principal civil engineer of the road testified that the mitered rail and locking device was similar to that in general use for years, but there was a factor of danger in all drawbridges crossed by railroads. One of the signal engineers employed by the road said that there is no system of draws and rail locks which can be considered absolutely safe, and it is necessary to depend upon watchmen to insure safety. On November 7 the coroner's jury rendered a verdict which placed the blame for the accident on the bridge watchman, thus confirming the opinion that the rails were not properly locked in line and that this was the initial cause of the disaster. This bridge tender was an old man, whose vision was only half-normal, and he was doubtless the weak member in the system of safeguards employed to protect this dangerous place. The principal lesson to be learned from all this is that when it is positively known and admitted that a costly system of signals and the best arrangement of locks at drawbridges do not insure safety, and it finally rests upon the activity of the watchman, then an able-bodied man with good vision should be selected for such positions and they should not be regarded as places where any decrepit but faithful servant could find a pleasant occupation.

Some of the other conditions surrounding this terrible accident should be noticed and, if possible, additional valuable lessons drawn from them so as to prevent its repetition on other lines. An illustration of the track over the drawbridge indicates that while substantial wooden guard timbers were used outside the track rails, no inside guard rails were employed. At the time of the accident the trucks were derailed and ran for some distance on the ties, but finally struck the outer guard timbers and swerved sufficiently to throw the cars over the side of the bridge. It is the general practice to use inside guard rails, as well as outside guard timbers, on drawbridges, and it is possible that if they had been used on the Thoroughfare bridge the trucks might have been kept in line with the track until they passed the draw and safely passed beyond the deep water. The accident should serve to emphasize the importance and real necessity of guard rails on each side of the main rails on all drawspans, and some explanation should be forthcoming from the officers of the West Jersey & Seashore road as to why inner rails were not used at the point where the accident occurred.

The speed of the ill-fated train as it approached the draw was about 20 miles per hour, and this must have contributed in no small measure to the certainty of derailment and subsequent overthrow at a point where the track was slightly defective. If the train had stopped at the draw and approached it at slow speed, it might have been derailed, but it is very probable that under such conditions it would have come to a stop on the bridge and would not have overturned. It is the general practice, on electric lines especially, for cars to come to a full stop at all dangerous places, such as grade crossings and drawbridges, and the fact that this was not the rule on the Atlantic City line shows that the signals and the watchman were regarded as sufficient safeguards, but the events attending such practice would appear to show this to be a mistake. The accident should be more thoroughly investigated and the other railroads properly advised as to just what mistakes contributed to this very serious accident we have been considering, and what changes should be made in present practice so as to absolutely prevent its repetition on other lines.

HIGH-EFFICIENCY LAMPS IN ELECTRIC RAILWAY SERVICE.

Within the last two years incandescent lamp design has undergone such remarkable improvement in respect to the production of more efficient lighting units that every progressive central station man is thoroughly interested in the situation, and in many cities the familiar carbon filament lamp of 3.5 or 3.1 watts per candle efficiency is in no small danger of being superseded. It is not surprising, therefore, that electric railway men should be inquiring into the merits of these improved lamps, with special reference to their operating economy.

There is not the least doubt that the modern high-efficiency lamp—which has now been commercially produced in the 20-candlepower, 50-watt size, with a useful life of 500 hours—is capable of giving a much greater volume of illumination for a given expenditure of energy than the old standard carbon filaments. In fact, the results show a gain in efficiency (for the same life) of 20 per cent, and a gain in life (for the same efficiency) of 350 per cent. Comparing standard 50-watt lamps of 2.5 and 3.1 or 3.5 watts per candle efficiency, it is at once evident that while the consumer's bill for service may remain constant, he receives much more light for the same money when using the higher efficiency lamps at usual lighting rates, say from seven cents per kilowatt-hour upward. What does this mean for the electric railway?

Any fair consideration of the cost of lighting service must include the cost of renewals as well as depend upon the cost of power delivered at the lamp terminals. The first cost of a 50-watt, 20-candlepower lamp may be taken at about 20 cents against 16 cents for a 54-watt or a 50-watt 16-candlepower "old style" carbon filament lamp. The current cost of 1.000 candlepower-hours of light with electricity at 3 cents per kilowatt-hour is 12 cents for a 4-watt-per-candle lamp, 10.5 cents for a 3.5-watt lamp, 9.3 cents for a 3.1-watt lamp, and 7.5 cents for a 2.5-watt lamp. Pro-rating the renewal cost on the percentage of the expired life to the useful life we find that the total cost of 1,000 candle-hours is 12.5 cents for the 4-watt, 11.5 cents for the 3.5-watt, 11 cents for 3.1-watt and 9.5 cents for the 2.5-watt lamp, the useful life of each being 2,100 hours, 1,000 hours, 500 and 500 hours, respectively. Considering the actual cost of this illumination, with three-cent power, there is no question about the economy of substituting higher-efficiency lamps for those of lower economy. On many street railways long life is considered a point of greater value in a lamp than high efficiency, and for this reason 4-watt-per-candle lamps are much in favor. But with three-cent power even the labor-of-replacement cost cannot undermine the greater economy of the 2.5-watt unit for a given amount of illumination, and the improvement in car lighting which is possible with a 20-candlepower unit is very well worth considering in its effect upon the passengers' comfort. On the other hand, where the lighting is to be effected by 8 or 10-candlepower units, the high-efficiency lamp capable of meeting the requirements is not on the market as yet, if indeed it will be in the near future.

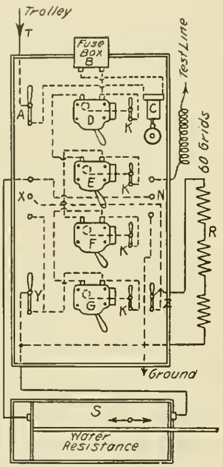
The cost of power on many of the larger street railway systems is much nearer one cent per kilowatt-hour at the lamp terminals than it is three cents. Under these circumstances the power cost of 1,000 candle-hours of light is 4 cents for the 4-watt lamp, 3.5 cents for the 3.5-watt, 3.1 cents for the 3.1-watt and 2.5 cents for the 2.5-watt lamp. Estimating the renewals as before, we find that the total cost of 1,000 candle-hours is 4.5 cents for either the 4, 3.5 or 2.5-watt lamps, and 5.1 cents for the 4-watt unit. It is important to bear in mind the fact that renewal costs may be figured on several different bases, with room for slightly varying conclusions. This method, as stated, however, clearly indicates that the high-efficiency lamp of 50 watts consumption holds its own, even at the low rate of one cent per kilowatt-hour, but that it becomes more and more valuable as the cost of power rises. In car houses and shops there is no question that the superior distribution of light found in the new complete units—with the proper kind of reflectors—renders the metallized filament superior to the old-time carbon filament of lower efficiency. First-class light distribution in ample quantity has a value in stimulating shop production which can scarcely be estimated with exactness. As for the car service, exhaustive life tests under the conditions of service on different divisions with varying voltages and mechanical shocks, should be made before a final decision is reached as to the adoption of high-efficiency lamps.

Under the title "Experiments on the Strength of Treated Timber" the Forest Service of the Department of Agriculture issues the report of Prof. W. Kendrick Hatt, civil engineer of the Forest Service, on the experiments carried on by him in investigating methods of preserving timber and studying the influence of preservative processes upon the strength of wood. The experiments were begun at the St. Louis Exposition and were continued at the timber testing station of the Forest Service at Purdue University, Lafayette, Ind.

A METHOD OF TESTING CAR CIRCUIT BREAKERS.

An arrangement of connections and parts for testing car circuit breakers in place, by means of other circuit breakers, is shown in the accompanying illustration. The circuit breakers used are adjusted to predetermined operating values with an ammeter which is put to no other use than for occasionally checking the adjustment of the test breakers.

Following the diagram we have: T, the trolley; A, the main switch; B, a fuse box; C, a coarse wire solenoid, the plunger of which falls on a bell when the test circuit opens; D, E, F and G, test circuit breakers set at progressively increasing operating values depending on the capacity of the car circuit breaker to be tested. In connection with each test breaker is a switch K in parallel with the circuit-breaking contacts of that breaker. When K of any particular breaker is closed, the current for which the breaker is set will cause the breaker handle to throw to off position as ordinarily, but the circuit will not be interrupted because there is still an alternate path through the auxiliary switch, K. With K open, the corresponding breaker operates in the regular manner. R is a grid resistance, and S is variable water resistance. By means of switches X, Y and Z the water and iron resistances can be thrown into combinations. With X down, Y open and Z closed, the water and iron resistances are in series. With X up, Y and Z closed, the resistances are in parallel. With X up, Y closed and Z open, the water resistance is available alone. These combinations afford currents between 25 and 500 amperes and adapt the outfit for other testing purposes. Switch M in the upper position leads to a long flexible test line for hooking to the trolley of the car, the breaker of which is to be tested. In the lower position of N the test circuit is provided with a local ground as indicated.



Connections for Testing Car Circuit Breakers.

The car breaker capacities being tested with this particular board are 285, 335 and 385 amperes. Accordingly, beginning at the bottom, the test breakers are adjusted to operate at 260, 310, 360 and 410 amperes. The test breakers used are of the Westinghouse type, with the main contact and throw-off spring removed, the toggle joint heeled and all lost motion taken up.

Assuming that the breaker to be tested is in place on a car and that there are no facilities for connecting the test line to it, the car pole is pulled down and the test line hooked over it. Both motors are then cut out in the controller, the brake set to keep the car from starting and the controller advanced to the last series notch to cut out the car starting-coil.

If the capacity of the breaker to be tested is, say, 385 amperes, switch K is closed on all breakers except the 410 breaker which will then open the circuit when it operates. The iron resistance is primarily intended to provide a certain maximum current in this case of about 200 amperes and the current is then varied with the water box. The constant iron resistance reduces the size of the water box required. If the water box plates are pushed far apart, X thrown up and Y closed, then on closing A, a small current traverses the test breakers, water box and car breaker in series. On closing Z the current jumps to over 200 and is then gradually increased by pulling out the water-box handle until either the car breaker or the top test breaker operates. The adjustment of the car breaker must be changed until it operates about half-way between the 360 and 410-ampere test breakers.

An ammeter test will show that by the use of this apparatus a little experience will enable a man to adjust breakers within two per cent and much faster than can be done with an ammeter. The water box used in the test has inside dimensions of 2 by 3½ by 5½ inches. The movable plate almost fills the 2 by 3½-inch cross section and has four 3-inch holes cut in it to make it easier to move the plate in and out against the friction of the water. This outfit may be installed in a car and then be made to serve for testing the breakers and starting coils of all the rolling stock for a large system.

CAR SIGNS AT INDIANAPOLIS.

In the Street Railway Review for July, 1900, was published a description of the car signs adopted by the Indianapolis Street Railway Company; these were similar to signs which had been made the standard in Detroit. Since 1900 this style of sign has been very widely adopted throughout Ohio and Indiana, in St. Louis and by the Public Service Corporation of New Jersey. As originally made at Indianapolis, the sign was made of ½-inch poplar wood, with letters 5 inches in height sawed out; the width of each element of the letters was 1 inch. The boards were painted black with white strips ¼ inch wide around the edge of the letters, and on the back was placed a sheet of white celluloid. Thus, by day the signs would show a white letter 6 inches high, with each element 1½ inches wide, white on a black background, and at night would show slightly smaller, the letters being white and illuminated by the car lights shining through the celluloid back. Each car was provided with four of these signs, placed one at each end and one at each side of the monitor in the car roof. In addition to these signs there were adopted at that time smaller signs, made of sheet metal stencils with white celluloid backing, placed at the edge of the hoods to distinguish such cars as only ran part way to the terminus of the route.

In practice the Indianapolis Traction & Terminal Company has found that the signs of poplar wood were easily broken and considerable expense was incurred in keeping them in good order and, accordingly, the master mechanic, Mr. W. H. Evans, has been experimenting with a sign of the same general character consisting of a frame of oak having top and bottom rails about ¾ by 1 inch in section with vertical pieces of the same size, spaced so as to come between letters. This frame is then covered with a sheet of white celluloid, tacked on the front side, with the outer surface painted to show a 6-inch letter, white on a black background.

The hood signs are similarly made with a frame of oak, which is 6 by 23 inches and covered with white celluloid painted to show 3½-inch letters on a black background. The smaller signs have been satisfactory in service, but the large signs described are yet considered as an experiment, one objection to them being the weight consequent upon using oak for the frame instead of a lighter wood.

On Indianapolis cars there are also carried dash signs, used largely for advertising purposes. These are boards about 18 by 30 inches in dimensions and have at each end a ¾-inch iron pin projecting 3 inches below the lower edge. Holes are bored in the top of the buffer into which these pins fit, holding the sign securely and yet permitting it to be changed readily. The board usually has on one side a statement "This car to" (the particular attraction), and on the other an announcement as to the location of the attraction in question. The former sign is displayed on the front of the car and the latter on the rear end, the boards being turned whenever the car reverses its direction.

RAILWAY TUNNELS TO MANHATTAN ISLAND.

The extent to which facilities for rapid transit to and from Manhattan Island, other than the ferries and the bridges, are being provided by the building of tunnels under the North (Hudson) river and the East river is not thoroughly understood, though much has been published about some of the individual projects. While it will be several months, at least, before cars can be operated through any of these tunnels, the completion of all tunnel work now actually under way will open to traffic 14 subaqueous tubes, 6 under the Hudson and 8 under the East river.

Tunnels Under the Hudson.

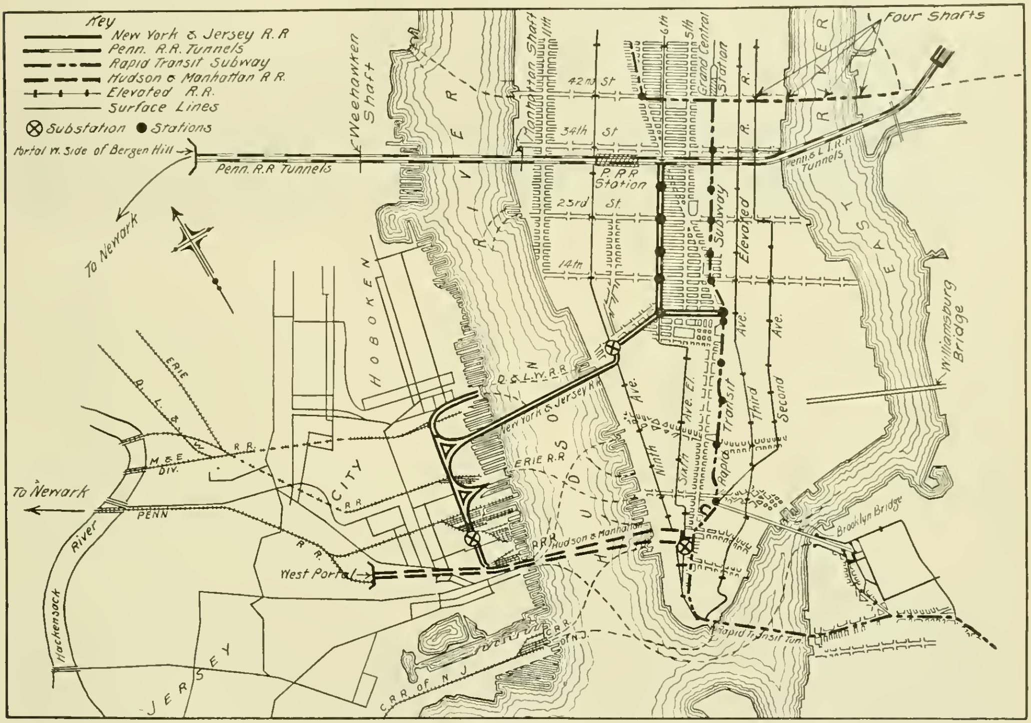
Four tunnel tubes are now excavated under the Hudson's mile of breadth and there are two others the shields of which are half-way across the river. These are as follows:

1. Two parallel tunnels of the New York & Jersey Railroad, from the foot of Fifteenth street, Jersey City, to Morton street on Manhattan Island. These are single-track tunnels with an interior diameter of 15 feet 3 inches and a length of 5,100 feet. They are built for the operation of cars of the subway type, taking current from a third-rail and equipped with Sprague-General Electric multiple-unit control. The shields in the north bore reached the New York side on March 11, 1904, and in the south bore on September 25, 1905. Preliminary work is in progress on the roadbed and electrical equipment. The power station will be located between Jersey City and Newark, N. J. There will be three substations, one in Jersey City and two in New York.

2. Two tunnels of the Hudson & Manhattan Railroad, almost identical in design with the tunnels of the New York & Jersey Railroad. These extend from the foot of Exchange place, Jersey City, to a terminal on Church and Fulton streets, Manhattan. Work was started on the Jersey shaft of these tunnels on May 2, 1905, and has progressed to a point just beyond the center of the river.

3. Two single-track tubes, built by the Pennsylvania Railroad, at Thirty-fourth street. These will have an interior diameter of 19 feet and their length, from the Weehawken to the Manhattan shaft, is 6,000 feet. The heavy trains of the Pennsylvania will be hauled through these tunnels by electric locomotives taking current from a third-rail, and it is understood that suburban cars will be operated by multiple-unit control. Work was started on these tubes by the O'Rourke Engineering Construction Company on April 13, 1904. The shields in the north bore met on September 12 and in the south bore on October 9 last. The placing of screw piles as a foundation for the tubes, one of the most difficult features of the work, will require a year or two.

For all of the tunnels under the Hudson river Mr. Charles M. Jacobs is chief engineer.



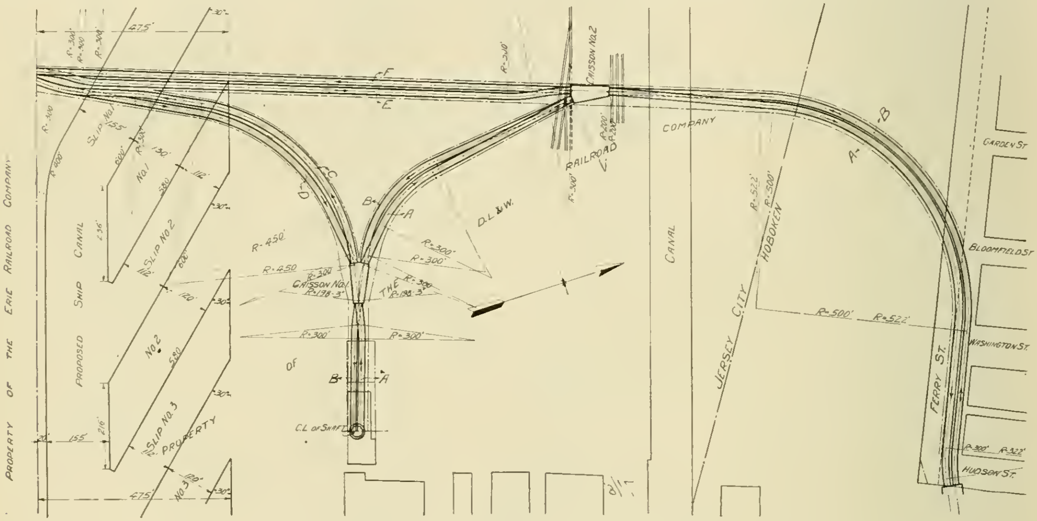
Tunnels to Manhattan Island—Map Showing Location of Tunnels Connecting New Jersey and Long Island with Manhattan Island.

The first attempt to make it possible for passengers to reach Manhattan Island by rail from Jersey City was made in 1874 by Dewitt C. Haskin, who formed a company for this purpose. Shafts were started at the foot of Fifteenth street, Jersey City, and later at Morton street on Manhattan Island. No work of importance was done until 1880, 1881, 1882, during which years 1,547 feet of tunnel was built. This work was abandoned on account of lack of funds and in 1890 was resumed by S. Pearson & Sons, the English company which is now engaged in building the four tubes under the East river, which comprise the Long Island extension of the Pennsylvania tunnel scheme. This company extended the tunnel 1,700 feet, but the work was again abandoned on account of lack of funds.

On February 11, 1902, the New York & Jersey Railroad was incorporated with Mr. W. G. McAdoo as president, to perfect the tunnel route. A construction company was organized to proceed with the work. On March 20, 1903, the same interests organized the Hudson & Manhattan Railroad, with Mr. McAdoo as president, to operate a rapid transit line through two tunnels to be built from the Pennsylvania ferry terminal at the foot of Exchange place, Jersey City, to Cortlandt street, New York, with a terminal occupying two blocks of ground on Church and Fulton streets. In January, 1905, the construction company in charge of the New York & Jersey tunnel was reorganized as the Hudson Companies, with Mr. W. G. Oakman, a director of the New York & Jersey Railroad, as president, and with Mr. W. G. McAdoo as one of the directors. This company has charge of the construction of the tunnels for the New York & Jersey Railroad and the Hudson & Manhattan Railroad. It is planned to consolidate the latter companies probably as the Hudson & Manhattan Railroad to operate the two systems as one. The accompanying map shows the general location of all of these tunnels.

Work is now in progress on the New York & Jersey tunnels up Christopher street to a point not far from Sixth avenue. In order to save time a contract has been made with the Degnon Contracting Company to continue this subway from Fourteenth street under Sixth avenue to a terminal on Thirty-third street, within a block of the new station which the Pennsylvania Railroad will build in connection with the Pennsylvania tunnels. No physical connection will be made between the New York & Jersey and the Pennsylvania tunnels, but passengers may easily transfer from one terminal to the other. From the junction of Sixth avenue and Christopher streets a branch of the subway will be built to a point near the Astor place station of the Interborough Rapid Transit subway, where a station will be built which will be connected by a covered passageway with the Interborough station. Subway stations also will be located, as indicated on the map, at convenient intervals along Morton and Christopher streets and Sixth avenue, namely, at Morton street and the river, at Sixth avenue and Christopher street, at Fourteenth, Eighteenth, Twenty-third, Twenty-eighth and Thirty-third streets.

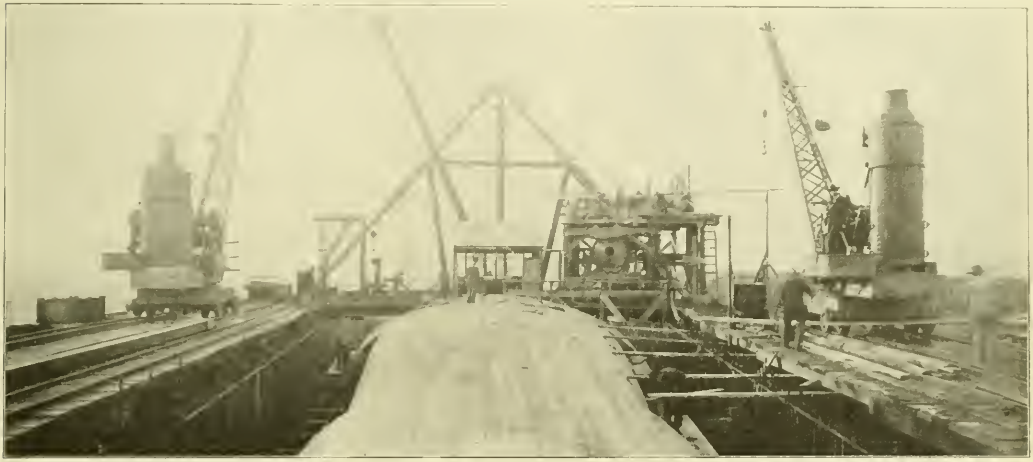
As indicated, the tunnels for the Hudson & Manhattan Railroad gradually diverge as they approach Manhattan Island. This is with the purpose of forming a loop, with sufficient space at the end for the terminal station platforms. The terminal, occupying two blocks, will face on the west side of Church street. From this terminal a covered passageway will lead to the Interborough Rapid Transit subway under Broadway at John street. One of the accompanying illustrations gives an idea of the arrangement of tracks and platforms in this terminal. On the terminal site two large office buildings, 20 stories in height, will be built. For these buildings five caissons have been sunk along Church street and three caissons in other parts of the foundation are being driven. On the Jersey side of the river excavations are practically completed for a subway station under the present Pennsylvania ferry terminal. From this point the tunnels will be continued west about a mile under Jersey City to a point near Summit avenue. From the outbound portal, there, the electric cars of the Hudson & Manhattan Railroad will run over the Pennsylvania Railroad tracks to a new Pennsylvania station at Newark, N. J. This station will be a junction from which electric locomotives will take the Pennsylvania through trains by way of the new northern detour through the Pennsylvania tunnels into the new Thirty-fourth street station. Passengers arriving over the Pennsylvania who do not care to be taken uptown may transfer at the Newark junction to the electric cars for the downtown terminal of the Hudson & Manhattan Railroad.



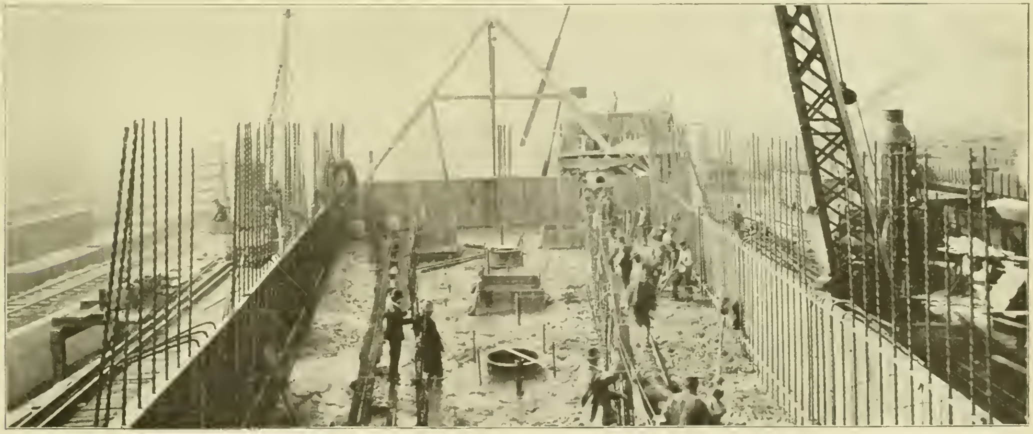
Tunnels to Manhattan Island—Layout for Caissons and Tunnels under Property of the Delaware Lackawanna & Western Railroad Company—Hoboken & Manhattan Railroad.

The routes by which the passengers arriving at either the Lackawanna or the Erie ferry stations on the Jersey shore will be served by the tunnel cars are shown also on the accompanying map. Both at the terminals of the Pennsylvania and the Erie in Jersey City and of the Lackawanna in Hoboken a great many passengers are delivered by the street cars of the Public Service Corporation, this traffic being particularly large at Hoboken. Passengers arriving at these points by whatever means, will have the choice of ferry or tunnel to uptown or downtown destinations on Manhattan Island. A proposed loop of the tunnel to the ferry terminal of the Central of New Jersey will not be built at present.

In each pair of tunnels one tube will be used for traffic in one direction and one for traffic in the other direction. It will be seen from the manner in which two terminals, one at the right and one at the left, are served by each pair of tunnels, that in either case both terminals will receive cars from and return cars to each pair of portals. This in each case would make it necessary for the inbound and the outbound traffic to cross each other at grade. This difficulty has been overcome by bringing the parallel tunnel tubes into vertical relation, so that when the point of divergence of the tracks to the right and left is reached the crossings at grade are eliminated, the tunnel outbound tracks to the Erie and Lackawanna terminals respectively crossing above and over the inbound tracks from those terminals. To establish a foundation for these crossings at the portals of the New York & Jersey Railroad tunnels a difficult feat of engineering was necessary. A very large reinforced concrete caisson, 105 feet long and from 20 to 45 feet wide, to embody these upper and lower tunnel chambers, was sunk 85 feet to solid rock foundation and completed with the placing of an invert. The first caisson of this character has been completed and occupies the position indicated upon an accompanying engraving, which shows the manner in which the tracks from the tunnels of the New York & Jersey Railroad are diverted to the Lackawanna and Erie terminals. A second caisson is under way at the point indicated on the engraving and a third may be built under the Erie property. Under the Pennsylvania ferry terminal the presence of solid rock foundation makes it unnecessary to use the caisson method, although the over and under crossing plan will be employed.



Tunnels to Manhattan Island—Placing Forms and Reinforcing Bars for Concrete-Steel Work in Caisson No. 1, New York & Jersey Tunnel.

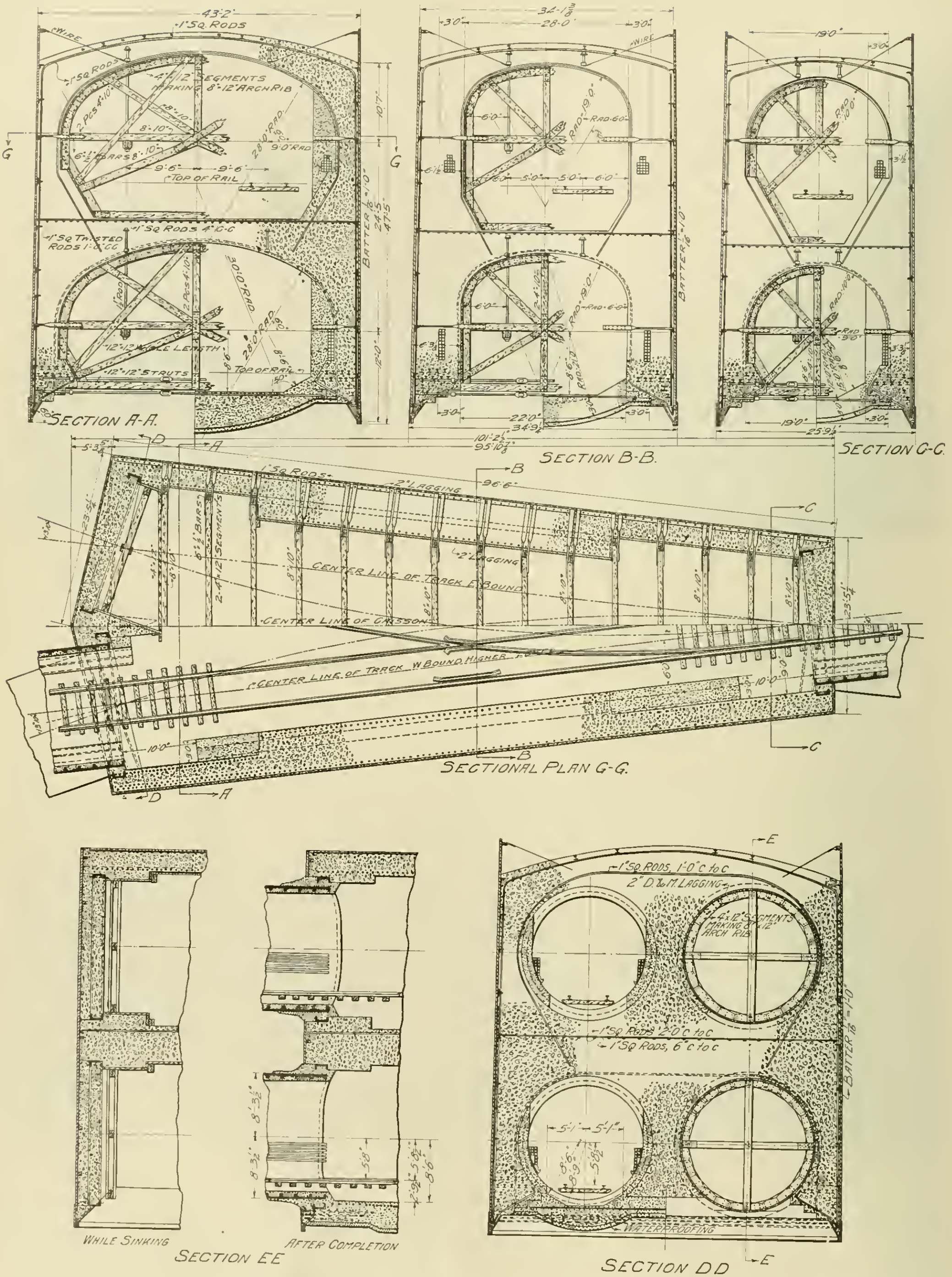


Tunnels to Manhattan Island—View of Caisson No. 1 when Partly Completed.

Tunnels Under the East River.

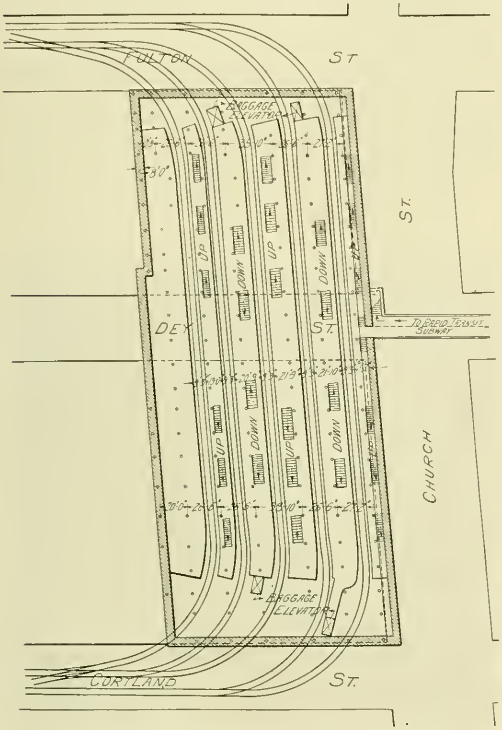
The 8 tunnel tubes upon which work is now in progress under the East river are:

1. Two single-track tunnels, being built under the direction of the board of Rapid Transit commissioners, by a company formed by Mr. John B. McDonald. These tubes extend from the Battery to Joralemon street, Brooklyn, connecting with a subway that is being built to the Flatbush terminal of the Long Island Railroad. The tubes will be about 7,000 feet long, 4,150 feet of which is between bulkhead lines; and they will have an interior diameter, finished, of 15 feet 6 inches. These tunnels have been built through



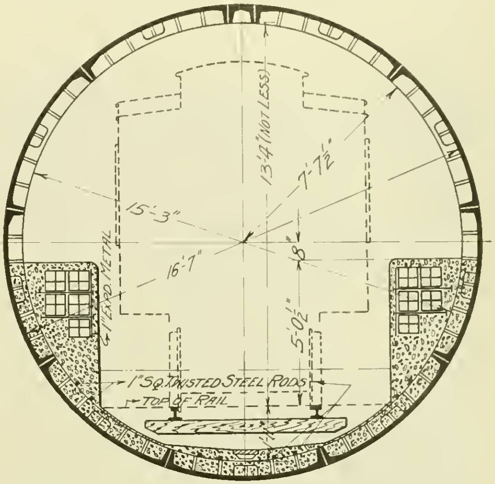
Tunnels to Manhattan Island—Plan and Sections Showing Details of Tunnel Construction and Location at New Jersey Approach, Hoboken & Manhattan Railroad.

solid rock for most of the distance and the headings are now less than 600 feet apart in the middle of the river. The substance yet to be penetrated is softer than that heretofore met with and shields have been inserted to complete the work. It is believed that the tunnels will be ready for track-laying by December of this year and that cars will be in operation possibly by March, 1907. Current will be taken from a third-rail and the tunnels will be operated as part of the subway system. Work was started on these tubes in December, 1902, under plans of the Rapid Transit commission, of which Mr. W. B. Parsons was then chief engineer. The work is now in charge of Mr. George S. Rice, chief engineer of the Rapid Transit commission, and Mr. George H. Pegram, chief engineer of the Interborough Rapid Transit Company, and of the construction company.



Tunnels to Manhattan Island—Plan of Church Street Station at Platform Level, Hudson & Manhattan Railroad.

2. Two single-track tunnels under the East river at Forty-second street, commonly known as the Belmont tunnels, are being built by the New York & Long Island Railroad under what is known as the old "Steinway franchise," under which the construction of such a tunnel was started in 1892 and abandoned in September of that year. These tunnels will have an inside diameter of 15 feet 6 inches and a total length of 17,000 feet. They are being driven by the Degnon Contracting Company from four shafts, one at Third avenue, one at each side of the river and one on Blackwell's Island reef in the center of the river. From each shaft headings are being driven in each tube in each direction, making a total of 16 headings. From Third avenue the work will be carried westward to a terminal not yet divulged, but the subway will have connection with the Grand Central depot and the Grand Central station of the Interborough Rapid Transit Company. The floor of the Park avenue end of the Belmont tunnel will be about 40 feet below that of the present subway. On the other side of the East river the tunnel proceeds to a point 2,000 feet beyond the shore line in Long Island City, where it emerges into an open cut which will connect with surface lines in Queens county.



Tunnels to Manhattan Island—Internal Concrete Lining for South Tunnel, New York & Jersey Railroad.

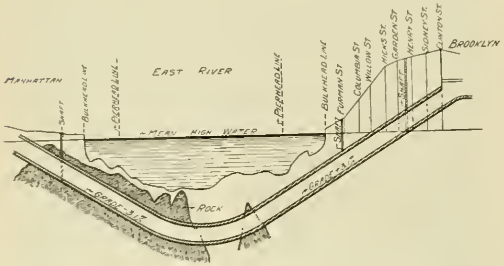
This underground system will be built according to subway standards suitable for the operation of cars by the third-rail and multiple-unit systems. Whether surface cars from various lines comprising the New York & Queens County Railway system are continued over the tunnel route or provision is made for transfer to cars of the subway type for rapid transit, the thousands of surface line passengers in Queens county who now depend upon the Forty-second street ferries will be able to reach the Grand Central depot and the New York subway system quickly and conveniently. Preliminary work on these tunnels was started in July, 1905. Excavation has been completed from Park avenue to the river and the headings between Manhattan and Blackwell's Island reef are expected to meet before January 1. The excavation of the lower segment of one bore should be completed during the

Tunnels to Manhattan Island—Interior of Rapid Transit Tunnel at Battery Park.

week beginning November 11. On the Long Island side the excavation has proceeded through rock a distance of 400 feet beyond the bulkhead line and the workmen have now encountered decomposed rock which permits of faster progress. The uncertainties of tunnel work are such that it is impossible to predict when track-laying will be made possible. The work on the New York & Long Island tunnels is under the engineering direction of Mr. St. John Clarke, chief engineer, and Mr. Allen Appleton Robins, chief assistant engineer.

Tunnels to Manhattan Island—Curve at Morton and Greenwich Streets—East-Bound Tunnel New York & Jersey Railroad.

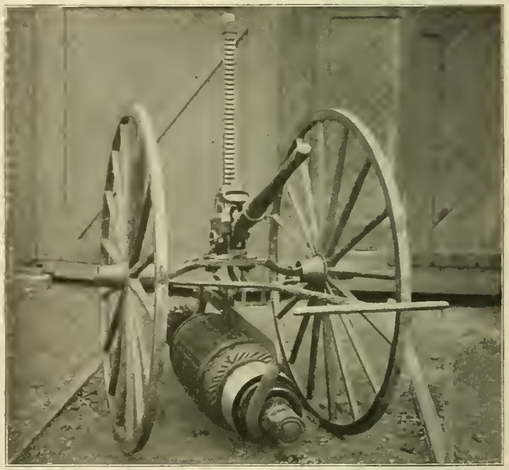
3. The four other tunnels under the East River are the four parallel tubes which comprise the Pennsylvania Railroad's tunnel extension to Long Island City. The contract for building the subaqueous section of these tunnels was awarded to S. Pearson & Son in March, 1904, and the installation of special machinery and a large compressor plant was immediately begun. These tubes will be of the same dimensions as those which the Pennsylvania has driven under the Hudson. The work of sinking the shafts was not begun until 1905. On the Manhattan side of the river the subaqueous portion of the tunnel, which has a total length of 3,900 feet, has progressed from the shafts at First avenue on Manhattan Island to points beyond the pier head line in three of the four tubes, two having crossed the Manhattan channel to Blackwell's Island reef, and from the Front street shaft, in Long Island City, a beginning of 150 feet has been made. There is approximately 3,000 feet of subaqueous tunneling to be done in each tube. The other part of the tunnel work east of the proposed new station at Seventh avenue is in charge of the United Engineering & Contracting Company, and the work has progressed as follows: Headings under Thirty-third street have been driven westward from a shaft between Madison avenue and Fourth avenue to a point west of Fifth avenue and east to a point between Lexington avenue and Third avenue. Headings have been driven westward from a shaft near First avenue to a point between Second and Third avenues. Under Thirty-second street tunnels have been driven westward from a shaft between Madison avenue and Fourth avenue to a point between Madison avenue and Fifth avenue and, eastward, to a point between Lexington and Third avenues and from a shaft near First avenue westward to a point between Second and Third avenues. In Long Island City work has progressed westward from a shaft near East avenue to a point between Front street and West avenue.



Tunnels to Manhattan Island—Profile of Rapid Transit Tunnel under East River, Drawn to Exaggerated Scale.

COMBINATION TRUCK AND HOIST.

An armature truck that serves the purpose of a hoist for raising armatures from a pit was recently designed and built by Mr. James R. W. Gregg, master mechanic of the Day- & Xenia Transit Company. The truck, illustrated herewith, is now being used with good results at the shops of that company.



Combined Armature Hoist and Carriage as Used at Dayton, O.

The wheels are 48 inches in diameter. They are supported by a split axle which aids in balancing the load. Mounted on the axle is a No. 8 box track jack with a 36-inch ratchet arm, at the lower end of which is attached a steel hook and an iron saddle adjustable to any size of armature.

After an armature has been lowered by a pit jack from its bearings into the pit the truck is placed on planks spanning the pit immediately over the armature, the saddle is placed over the shaft and the ratchet arm lowered sufficiently to allow the hook to catch hold of the saddle. By means of the jack the armature is then raised until it swings clear of the floor level and the truck with its load may be drawn to any part of the shop. The truck is inexpensive and is so simple to operate that by its use one man can handle with ease the largest type of motor armature.

BOOK TABLE.

Catechism on Producer Gas. By Samuel S. Wyer, M. E., New York, McGraw Publishing Company, 1906.

The object of this little catechism is to give a brief description of the types of apparatus, methods used in manufacture, the history and advantages of producer gas. Gas engines are beginning to have such general use that some elementary information of this kind will be useful to those whose knowledge of engines has heretofore been confined to that of the steam type. The book contains 42 pages and has a few drawings of gas producers.

Handbook of Mathematics for Engineers and Engineering Students. By J. Claudel, from the seventh French edition translated and edited by Otis Allen Kenyon, New York. McGraw Publishing Company, 1906, 700 pages, price $3.50

The larger part of the material in this book has been taken from Claudel's "Introduction à la Science de l'Ingenieur," a pocket-book for engineers and architects which has passed through seven editions in France. The book is intended primarily as a reference book. It is also well adapted to the use of the student. It covers in one volume a clear and full treatment of arithmetic, algebra, geometry, trigonometry, analytic geometry and elements of calculus, and all these are treated with special reference for use by the engineer.

Wiring a House. By Herbert Pratt. Pamphlet 22 pages and cover, 5½ by 8 inches. New York, 1906. Published by The Derry-Collard Company. Price 25 cents.

This is one of a practical paper series published by the Derry-Collard Company and has been written by a practical man who has planned many houses and other buildings. The pamphlet opens with the plans of a house and the various steps incident to wiring the structure for electric lights are successively taken up, attention being paid to the meter, cut-out cabinet, circuits, etc., and formulas being presented for figuring the size of wire with given voltage loss. Instructions are provided for running wires through partitions, making joints, preventing corrosion of contacts, and other useful information is given.

General Specifications for Steel Railroad Bridges and Viaducts. Revised Edition, 1906, by Theodore Cooper. Engineering News Publishing Company, 220 Broadway, New York, 36 pages, price 50 cents.

Cooper's specifications for steel bridges have been in use for over a quarter of a century and this is the tenth revised edition. Quite a number of changes have been made throughout the pamphlet as previously published. The standard train loadings now extend to E50, which corresponds to maximum load on one pair of drivers 60,000 pounds. We notice in table No. 3, page 34, a column marked "maximum load on one driver," which evidently should be on one pair of drivers or one axle. The pamphlet is 7x9½ and pamphlets of this kind which are in general use should be standard size 6x9 or 9x12.

The Elements of Machinery, Volume I. An illustrated technical dictionary in six languages—English, German, French, Russian, Italian, Spanish. Compiled by K. Deinhardt and A. Schlomann, with 823 illustrations and numerous formulas, New York, the McGraw Publishing Company, 1906, 403 pages, price $2.00.

This is the first of a series of technical dictionaries to be published by the McGraw Company, and the present volume relates to the elements of machinery and the tools most frequently used in metal and wood working. The further volumes to appear shortly will relate to electric machinery; steam boilers and steam engines; hydraulic machinery; hoisting and conveying machinery; small tools and machine tools; railways and locomotives; bridges and structural iron work; metallurgy; architecture and naval construction. These dictionaries are small size, 4x7, so as to be convenient for pocket use and will thus be found useful for engineers going abroad. The principal improvement over previous dictionaries is the use of the graphic language, the sketch, the formula and symbol which are understood everywhere. By the aid of this universal technical language the translation was made in workshops and offices abroad and thus has a claim to great accuracy and correctness. The page is divided into three columns; in the first column is the word in German, English and French; in the third column Russian, Italian and Spanish. The second column is occupied by sketches, formulae and symbols and each group of words on a page is numbered. At the end of the book there is an alphabetical arrangement of words in five languages combined, and a separate one for the Russian language. These indexes have reference to the page and number in the body of the book. This initial volume is certainly a very satisfactory technical dictionary and the series will prove to be of great value to libraries and to engineers, who have frequent reference to foreign terms.

Practical Alternating Currents and Power Transmission. 1906. By Newton Harrison, E. E. 5 by 7⅜ inches. 375 pp. Cloth. Price $2.50. W. L. Hedenberg Publishing Company, 136 Liberty Street, New York.

As suggested by the author in his preface to this book the subject is so broad that it would hardly be possible to attempt to include a complete discussion of it in a work of this size. It is also observed that the author has endeavored to present a comprehensive discussion of practical alternating current and power transmission work in such a way that the arguments may be grasped by one unacquainted with higher mathematics. All calculations, as far as possible, are made in arithmetic and much of the preliminary matter found in larger treatises on this subject has been eliminated. In the discussion of the more complicated subjects, practice has been given first place, and for this reason as well as for its general usefulness the book is to be recommended to those who are real workers in the power transmission field.

Management of Electrical Machinery. By Francis B. Crocker, E. M., Ph. D., and Schuyler S. Wheeler, D. Sc. Sixth edition. Cloth, 223 pp. 4½ by 6¼ inches. New York: D. Van Nostrand Company, 1906. Price, $1.00 net.

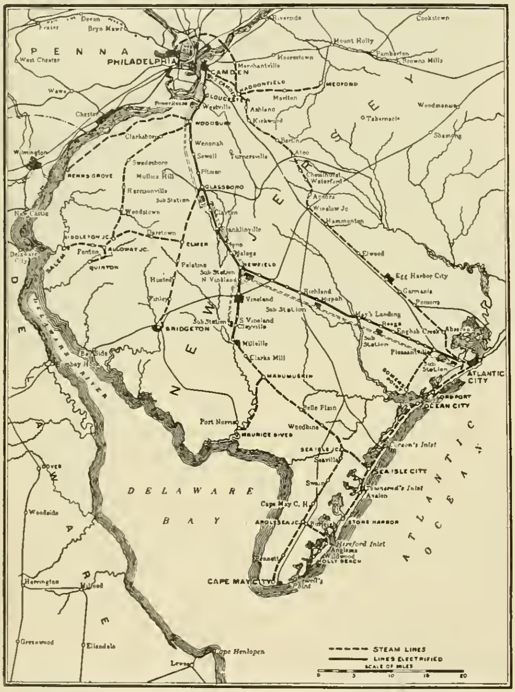
Since this book was first published 14 years ago under the title of "Practical Management of Dynamos and Motors," the progress in the electrical field has been remarkable. To meet these conditons the book has been completely revised and many additions, which make its contents timely, have been introduced. There has also been added to the material first published much information in keeping with the earlier style of the book regarding new types of apparatus that have been adopted during the last few years. For one who desires a handy reference book and source of information for daily use in the operation of electrical machinery, the book can be highly recommended.

In the first few chapters the authors consider the subject of generators and prime movers from the standpoints of construction, installation and operation. The various methods of connecting generators with the sources of driving power and the proper connections for wiring the various types of generators and motors are considered. Practical information is included regarding such subjects as the balancing of armatures and the installing of various safety devices. The middle portion of the book deals more with the details of machinery operation and suggests methods for making commercial tests and keeping generators and motors in good operating condition. Under the section dealing with "Remedies for Trouble" the chapters relate to the heating of field magnets, bearings, noisy operation, increased speeds, variations in voltage, etc. The latter part of the book is devoted to the description of and suggestions for operating and repairing arc lighting machinery of the Brush, Ft. Wayne and Thompson-Houston types of constant-current, direct-current machines. An interesting chapter is that which includes a set of questions and answers to assist in localizing and remedying operation troubles. The final chapters relate to the maintenance of railway motors.

ELECTRICAL EQUIPMENT OF THE WEST JERSEY & SEASHORE BRANCH OF THE PENNSYLVANIA RAILROAD.

The Pennsylvania Railroad has equipped for electrical operation its West Jersey & Seashore branch, extending from Camden, N. J., via Newfield, to Atlantic City, a distance of 65 miles, and from Newfield to Millville, a distance of 10 miles. In addition to the erection of a power house, this work has called for the building of 8 substations, one of which is in the power house, the electrical equipment of approximately 150 miles of single track, the building of 71 miles of duplicate high-tension transmission line and the construction and electrical equipment of 68 cars.

The Pennsylvania Railroad has two roads connecting Camden with Atlantic City. It is the longer one of these routes that has been electrified. The power house and substation equipment and the line are laid out with a view to supplying sufficient power for an express service from Camden to Atlantic City consisting of three-car trains running on a headway of 15 minutes in each direction at a speed on straight level track of 60 miles per hour, and for a local service of two-car trains between Camden and Millville on half-hour intervals, and single cars between Camden and Woodbury on 10-minute intervals. The initial schedule that has been put into service includes three-car express trains between Camden and Atlantic City on one-hour intervals, the running time being 90 minutes, and a local service of two, three and four-car trains run on a minimum interval of 15 minutes during the rush hours between Camden and Glassboro, every fourth train going on to Millville. The motor, baggage and mail cars are attached to the passenger trains as conditions require.



West Jersey & Seashore Railroad—Map Showing Electric and Steam Lines between Philadelphia and Atlantic City.

The Power House.

The power house is situated at Big Timber creek, just to the north of Westville, N. J., at a point 5.6 miles from the Camden terminal, where there is an abundance of water for boiler feeding and for condensing purposes. The site for the building was chosen on January 17, 1906. The first pile was driven on January 19. The boiler foundations were completed by March 25 and those for the steam turbines by June 5. The erection of the steel work for the main building was begun on April 18. On March 5 the foundations for the stacks were started and these were completed by the 25th of the same month. The steel work for the stacks was started on April 11 and the first stack was erected, lined and ready for use by June 29. On July 1, five and one-half months from the date upon which the first pile was driven, two boilers were under steam at working pressure, a turbine and all the necessary auxiliaries were running, the substation in the power house was in operation, and the first car to take current from the power house was run on the line. This fact speaks eloquently for the rate at which the work was executed.

The electrical equipment of the power house includes the following: Three 2,000-kilowatt, 6,600-volt, 25-cycle, three-phase Curtis turbo-generators; nine 700-kilowatt, 25-cycle, air-blast transformers; and three blowers, capacity of each 20,000 cubic feet per minute.

The switchboard consists of: Three three-phase generator panels, two exciter panels, three blower motor panels, one synchronizing equipment, three 33,000-volt transformer panels, two sets of lightning arresters and switches, six static potential indicators, and two 33,000-volt out-going line panels. The present normal capacity of the generating station is 6,000 kilowatts. However, there is sufficient room provided in the layout of the building for an additional 2,000-kilowatt turbo-generator set, together with the necessary auxiliaries.

The most important items among the auxiliaries are as follows:

(a) Two exciter sets, consisting of horizontal Curtis steam turbines coupled to 75-kilowatt four-pole General Electric direct-current generators running at 2,400 revolutions per minute and delivering 600 amperes each at 125 volts pressure. The turbines of these sets work non-condensing, as the exhaust is used for heating the feed water.

(b) Three barometric condensers, built by Williamson Brothers, in connection with Cramp & Company of Philadelphia, who were also the sub-contractors for the circulating and air-pumps. These condensers are capable of maintaining a vacuum of twenty-eight inches and are designed to condense 60,000 pounds of steam per hour with circulating water at a temperature of 70 degrees Fahrenheit. The approximate ratio of condensing water to steam condensed is 75:1.

(c) Three dry air pumps built by the I. P. Morris Company, of sufficient capacity to fulfil the guarantees given for the condensers.

(d) Three centrifugal circulating pumps, built by the I. P. Morris Company and driven by Reeve's engines. The piping for these engines is so arranged that the exhaust may be discharged to either the feed-water heater or to the third stage of the turbines, the latter arrangement only being used when the exhaust from the other auxiliaries exceeds that required for the feed-water heater.

(e) Two Cochrane feed-water heaters Each heater has a capacity for heating 135,000 pounds of water per hour from 70 degrees Fahrenheit to 212 degrees Fahrenheit.

(f) Two Worthington boiler-feed pumps.

(g) Two Worthington make-up pumps.

(h) Two Worthington step-bearing pumps.

(i) Three Worthington step-bearing water-return pumps.

(j) One accumulator for the step bearings with a capacity of 100 gallons of water at 800 pounds pressure per square inch. This accumulator was supplied by R. D. Wood & Co. of Philadelphia, Pa.

The boiler house is furnished with 12 Stirling water-tube boilers arranged in pairs forming six batteries. Each boiler is rated at 358 horsepower and is furnished with a superheater capable of delivering steam at 175 pounds pressure and at a temperature of 125 degrees Fahrenheit in excess of that of saturated steam.

The coal is dumped from the railway cars into a receiving hopper, whence it is raised to a crusher and conveyed by an automatic railway over the coal bunkers into which it is tipped. From these bunkers it is again fed to firing cars on the tracks on the boiler-room floor. The ashes are mechanically handled.

Substations.

The high-tension three-phase current is reduced in pressure and converted to a direct current at 650 volts in eight substations.

The equipments in the several different substations vary according to the requirements of the portion of the road they supply. In each of the substations but two there are two 750-kilowatt rotary converters. In these two the two rotaries are of 500-kilowatt capacity.

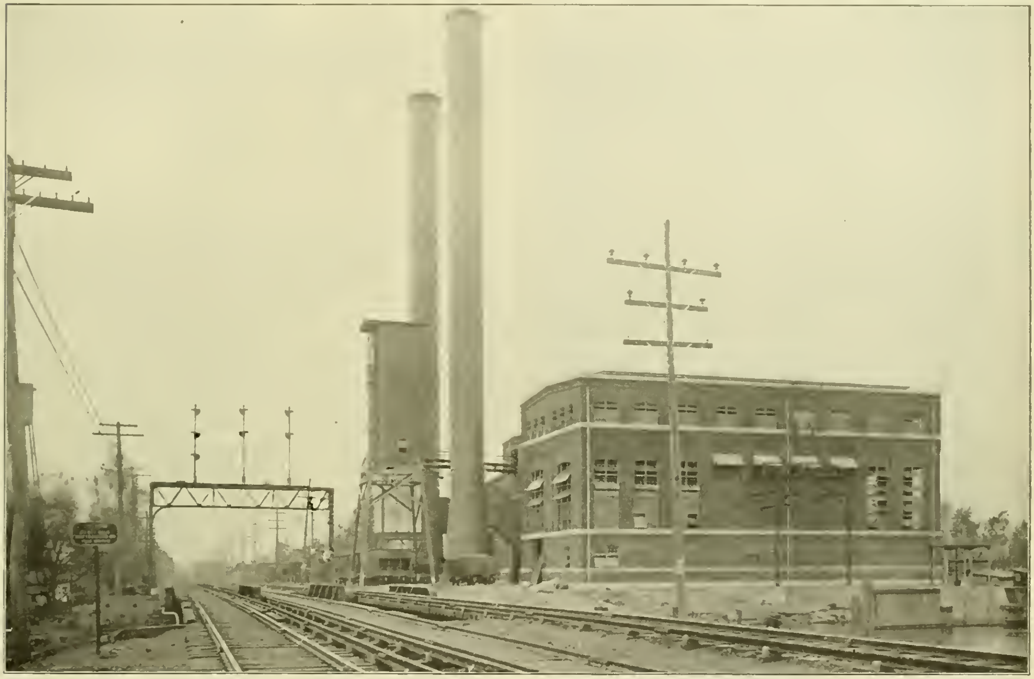
The rotary converters are all of standard General Electric design. The transformers are all supplied with taps giving one-third and two-thirds of the working voltage to enable the converters to be started from the alternating-current side. Three air-cooled transformers of standard design are provided for each rotary.

The disconnecting switches and lightning arresters in each substation are located in a separate room. The high-tension circuits are of bare copper wires supported on insulators on a pipe framework, and each pole of the oil switches is enclosed in a separate brick compartment. Precautions have been taken to provide for the continuous operation of the road under all traffic and weather conditions.

The substation buildings are of red brick, trimmed with Indiana limestone facings, and the floors are of concrete. Each substation is furnished with a hand-operated crane capable of handling any of the machinery installed.

It is a matter of interest that the substation buildings, including the foundations, were built in 60 working days and the machinery was installed in 30 working days.

Inspection sheds have been built at the three terminals. The largest one is on the dock at Camden, just back of the new passenger terminal. This is a three-track shed 221 feet long by 56 feet wide, accommodating nine cars, with room for office, storeroom and small machine shop at the end opposite to the entrance. All tracks have pits provided with steam heating, electric lights and receptacles, and compressed air outlets for cleaning. The third rail is not carried into the shed, overhead trolley being used instead. The center track has an overhead hand-operated crane, with runaway extending into the machine shop. The building is of wood frame construction covered with corrugated galvanized iron, with four-ply slag roof, and is supplied with large windows and skylights. Kinnear steel rolling doors are used at the main entrance. At Atlantic City the shed is of the same general arrangement but smaller. The shed at Millville has one track and is of sufficient length for one car, with space to work around a truck when run out at one end. In all of the sheds the track rail is carried on a stringer, which makes the top of the rail 12 inches above the floor level.


West Jersey & Seashore Railroad—General View Showing Westville Power House and Character of Main-Line Track Construction.

The High-Tension Transmission Line.

The 33,000-volt high-tension transmission line is in duplicate throughout. It is Y-connected, with the neutral grounded, and consists of six No. 1 hard-drawn copper wires mounted on three-part Locke porcelain insulators. The poles are of chestnut, 45 feet high. They are spaced 125 feet apart. Head guys are spaced one-quarter of a mile apart. There are two cross-arms, the top arm being 12 feet in length, carrying four insulators, and the lower arm, which is 8 feet 6 inches, carries two insulators. The six wires form two inverted equilateral triangles, and the insulators on each triangle are 42 inches apart. These wires in each triangle are transposed by one complete spiral between each substation.

For lightning protection, a seven-strand galvanized steel cable 5-16 inch in diameter is strung the entire length of the line on top of the transmission poles, four feet from the nearest line wire, and provided with ground connections at every fifth pole.

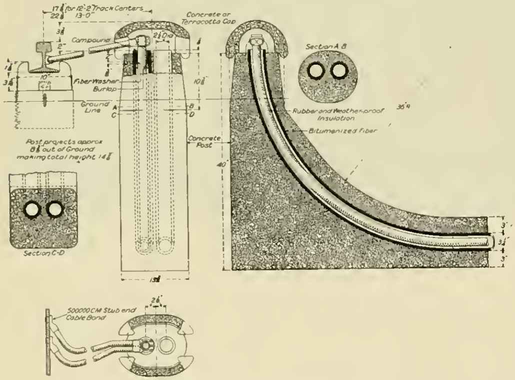
In all there are 71 miles of transmission line. This was erected at a speed of from one-half to two miles a day.

The Third Rail.

The rails used for the working conductor are of the Pennsylvania Railroad standard cross-section and composition; they come in lengths of 33 feet, weigh 100 pounds per yard, and have a conductivity about equal to that of 1,200,000 circular mils cross-section of copper. This type of third rail was used in order that it might be interchangeable with the track rails.

West Jersey & Seashore Railroad—View Showing Third-Rail Protection at Station Platform.

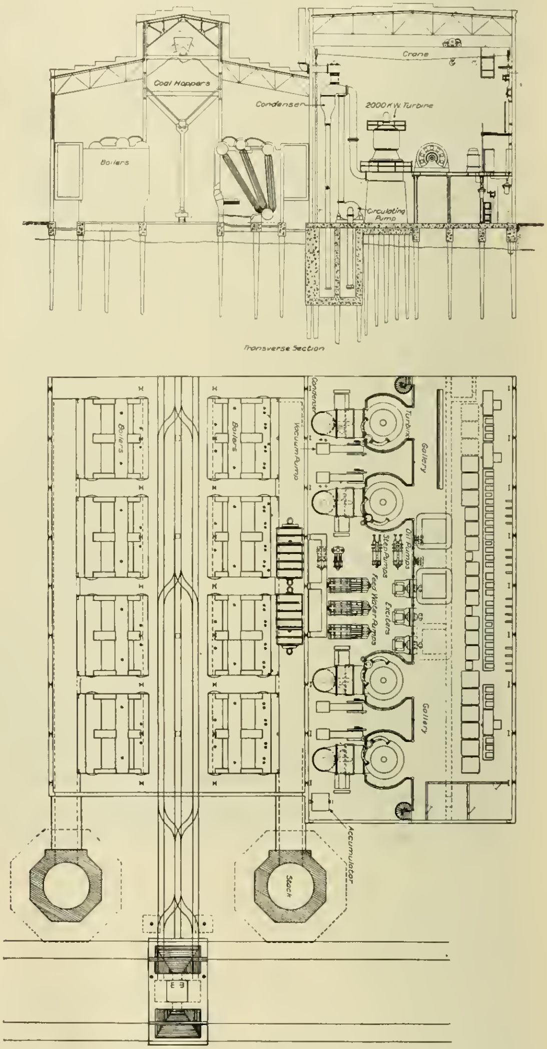
The insulators are of reconstructed granite, and are held in position by metal centering cups which are secured to the long ties by means of lag screws. The insulators are 10 inches in length and 5½ inches broad at the base, with an effective depth from the bottom of the rail to the tie of 3½ inches. The insulators are spaced about 8 feet apart. The top of the third rail is 3½ inches above the top of the track rails, and its center 26 inches distant from the gauge line of the adjacent track rail, these dimensions constituting the standard of the Pennsylvania Railroad and the Long Island Railroad, and also interchangeable with the Interborough Rapid Transit system of New York.


17 for 12'-2" Track Centers
22 13'-0"
Concrete or Terracotta Cap
Compound
2½ Dia
Fiber Washer
Burlap
Ground Line
A
B
C
D
10½"
Concrete Post
40"
Post projects approx 8½ out of Ground making total height 14½
Section A B
Rubber and Weather-proof Insulation
Bitumenized Fiber
36"
Section C-D
3"
3½"
3"
500000 CM Stub end Cable Bond

West Jersey & Seashore Railroad—Details of Protection for Third-Rail Connecting Cable.

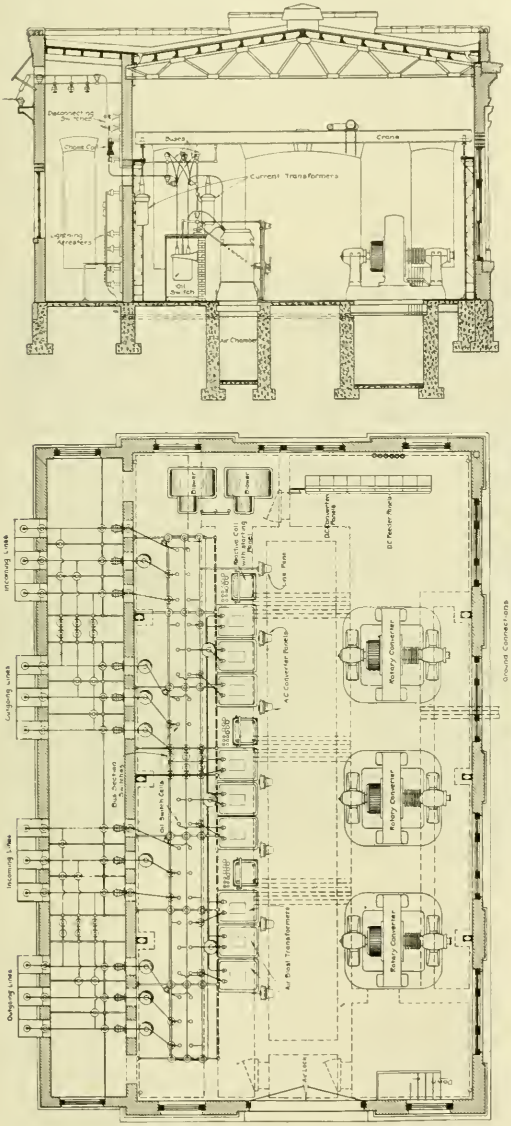
The approaches of the third rail are made of cast iron. The third rail is bonded with concealed ribbon bonds with solid copper terminals compressed into one-inch drilled holes in the rail. There are two bonds to a joint, and each has an area of 500,000 circular mils, giving a total area of copper per third rail joint equal to 1,000,000 circular mils. The work of bonding the third rail was accomplished at the rate of 660 bonds per day.

At highway crossings the connecting cable is drawn into a black bituminized fiber tube, which is laid in a solid concrete protection. Terra cotta covers are employed to protect the cable terminals. Those for single cable jumpers are of the round form and those for double cables of an elliptical shape, as shown.



West Jersey & Seashore Railroad—Plan and Section of Power House at Westville.

The third rail is anchored at intervals; this is accomplished by means of metal clamps secured to the under flange of the rail in such a position as to engage the insulator on either side. The third rails are arranged in such a manner that each track may be isolated from the other, but normally the third rails are electrically connected midway between the substations through a combined switch and fuse box, thus obtaining the combined conductivity of the third rails. There are also section insulators opposite each substation, so that in the event of an accident on any part of the system only a short section of the third rail would be dead.



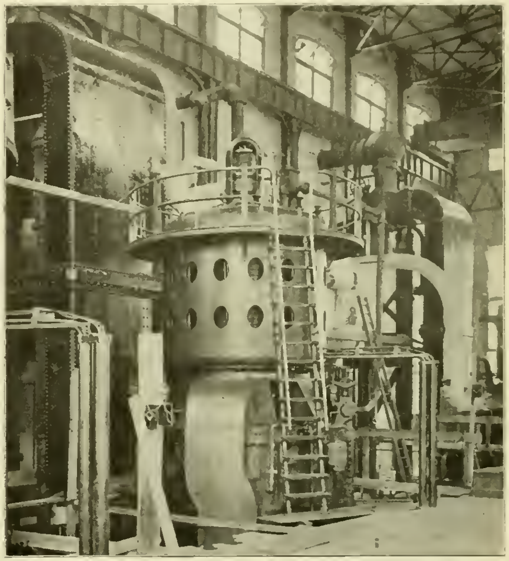
West Jersey & Seashore Railroad—Plan and Section of Typical Substation.

The company's right of way is fenced in, and at all crossings the fence turns in from the property lines to meet Climax cattle guards at the edge of the crossing. In this way the public is prevented from reaching the third rail. At all stations and in the Atlantic City and Camden yards the third rail is protected by a wooden top and side guard. Opposite all platforms the rail is further protected by a plank fastened to the side of the rail.

It is interesting to note that the third-rail system has been adopted at both terminal stations where there are a number of platforms, and it will be interesting to engineers to learn that this system was adopted on the score of less difficulties being encountered in its installation than would have been the case had an overhead trolley been erected.

Bonding of Main Tracks.

The bonding of the main track between Camden and Atlantic City was a work of great magnitude, which will be appreciated when it is stated that a heavy steam traffic was in progress during the whole period. All the holes were drilled by hand and the bond terminals were expanded by means of screw compressors. Two bonds of the concealed type were used at each joint, each with a capacity of 400,000 circular mils, and on account of the large size of bonds special angle plates had to be provided.



West Jersey & Seashore Railroad—Interior of Westville Power House Showing One of the Turbine Generating Sets.

Trolley Line.

The trolley construction between Newfield and Millville and between Haddon avenue and South Gloucester is of the span type, with poles spaced 100 feet apart. Where practicable the high-tension transmission poles have been used for supporting the span wires. Through Camden the greater part of the trolley construction is on tubular steel poles. The trolley wire is suspended 22 feet above the top of the track rails.

There are no copper feeders used on the third rail, but those for the trolley lines are as follows: two 750,000-circular mil feeders from South Camden to Haddon avenue, and one 750,000-circular mil feeder running from South Camden to Brown's Crossing. Both of these join with the third rail. The copper feeder between Newfield and Millville is of 500,000 circular mil section.

The length of line between Newfield and Millville is approximately 10 miles. The trolley wire is of No. 0000 grooved section, and the bonding is similar to that already described on other portions of the road. The span wires are of stranded galvanized steel ⅜ inch in diameter. The lightning arresters are installed at approximately 1,000 feet apart. All overhead fittings are of standard pattern.

Cars.

For initial service 62 passenger cars and 6 combination baggage and mail cars have been provided. All of the cars are motor cars, the motor and control equipment being the same on all.

The seating capacity is 58 passengers and the seats are of the Pennsylvania Railroad standard type, made by the Hale & Kilburn Manufacturing Company. Both ends of the cars are provided with vestibules and have the standard arrangement of steps, trap doors and vestibule side doors, with standard equipment of bronze hardware and grab handles. The vestibule center door is so arranged that when it opens it slides over and encloses the control apparatus. The bottom framing consists of 5 by 8 by 11-16-inch yellow pine side sills and 7-inch I-beams for center and intermediate sills. The center and intermediate sills are continuous from end to end of the car. The floor bridging is of yellow pine fitted into the intermediate sills and into the side sills, with blocking between center sills and between the intermediate and center sills, and is secured transversely by tie rods. Double diagonally-laid flooring is used, both layers being tongued and grooved, and between the layers there is ⅛ inch asbestos. The top flooring is of maple. The entire under side of the car is protected by ¼ inch of transite and above the motor truck steel plate over asbestos fire-felt is used. The needle beams are of 6-inch I-beams, and are supported at the ends in pockets which are provided with cast steel truss rod struts. The body truss rods are of 1¼-inch round iron, upset at the ends. The body bolsters are of the steel truss type, two being used at the motor end and one at the trailer end. The body bracing is of the "W" form with short diagonal bracing and cripple posts.

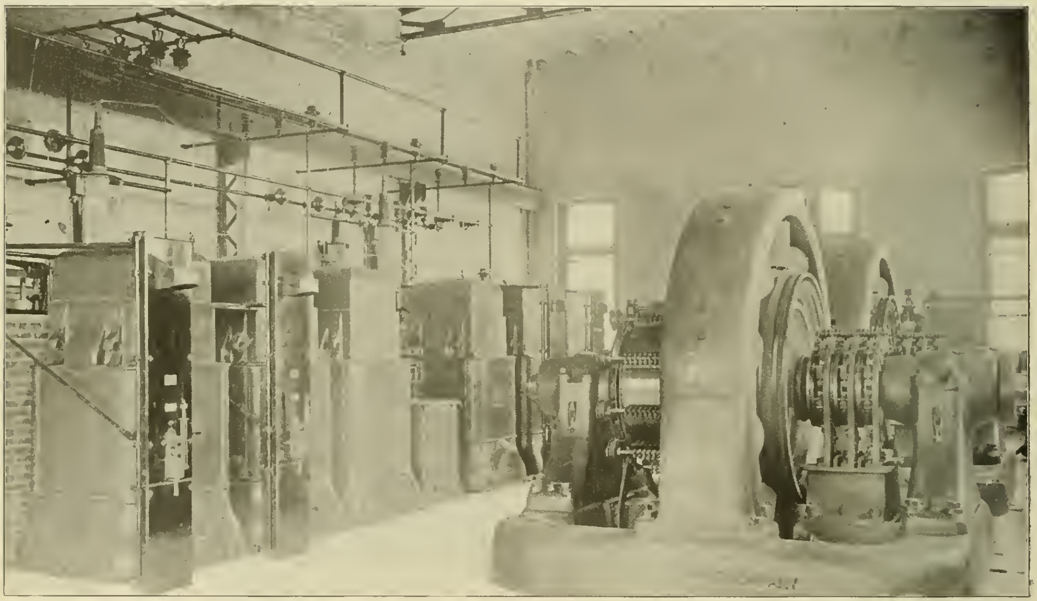
The general dimensions of the cars are as follows: Length over buffers, 55 feet 5½ inches; length over body end sills, 46 feet 6 inches; truck centers, 33 feet; with over side sills, 9 feet 8¾ inches; width over window sills, 10 feet; height from under side of center sill to top of roof, 9 feet 8½ inches; height from under side of center sill to top of rail (car light), 3 feet 7 5-16 inches, and height from top of rail to top of trolley wheel when hooked down on roof, 14 feet 8½ inches. Total weight of car, fully equipped, on track, 89,000 pounds.

The combination baggage and mail cars are of the same general dimensions as the passenger cars and have similar vestibules. The arrangement of the baggage compartment is similar to that of the standard Pennsylvania Railroad combination car, and the fittings and arrangements in the mail compartment are in accordance with the standard requirements of the postoffice department.

All cars are provided with 50-candle power incandescent electric headlights and two electric markers or route lamps on the hood at each end. These were manufactured by the Dressel Railway Lamp Works of New York. In the interior of the car there are five five-light clusters and in the saloon there is a single lamp. There are two lights in each vestibule, one being over each trap door, arranged in reflectors so that the lamp does not come below the vestibule ceiling. All wiring for lights is done in galvanized iron conduit on the roof of the car so that it is at all time accessible. Where the conduit goes through the roof to the fixtures, special roof plates are used, laid in lead so as to be water-tight. On the roof, in the center of the car, there is an illuminated numeral panel which permits the car number to be read from either side. The lamps in this panel are in the headlight circuit, so that they are only lighted on the leading car of the train.

Each car has two trolleys, each with a retriever, and on the roof between the trolley bases there is a box containing the lightning arrester, trolley cut-out switch and trolley fuse.

The cars are heated by Gold cylindrical heaters, one



West Jersey & Seashore Railroad—Interior of Substation at Atlantic City.

being under each seat, and a total of 28 heaters per car. There are two coils in each heater, thus providing three degrees of heat.

In the vestibule, at the saloon end of the car, on the motorman's side, there is a switchboard on which are mounted the headlight and air compressor switches and fuses, the switch for cutting out the contact shoes when operating on trolley, the trolley cut-out switch and current limit relay. This switchboard is provided with double steel doors lined with asbestos and is accessible from the vestibule. This switchboard, as well as all conduit wiring and fixtures for heating and lighting ,was installed by the General Electric Company.

The Wason Manufacturing Company built 22 of the passenger cars and the 6 combination baggage and mail cars; the American Car & Foundry Company built 22 passenger cars, and the J. G. Brill Company built 18.

Trucks.

The motor and trailer trucks are of the M. C. B. double side-bar equalized type, somewhat similar to those used on the cars of the Interborough Rapid Transit Company and the Long Island Railroad, but with greater wheel base. The general dimensions of the trucks are as follows: Wheel base, 7 feet; weight of motor truck complete, without motors, 14,934 pounds; weight of trailer truck complete, 9,653 pounds; weight on center plate (car body light) motor truck, 25,384 pounds; and weight on center plate (car body light) trailer truck, 26,065 pounds.

The wheels of the motor truck are steel-tired with separate cast-steel spoke centers. They are 36 inches in diameter with M. C. B. standard tread. Tires are three inches thick, shrunk and bolted to the steel center. The hub of one wheel on each axle of the motor truck is extended, and to this hub the forged steel gear is shrunk after the wheel has been pressed on the axle. The axles are of open-hearth steel and conform to the test requirements of the Pennsylvania Railroad standard specifications. The journals are 5x9 inches, the diameter of the axle at the wheel fit is 8 inches, and diameter between wheels is 7 inches finished all over.

Schoen solid rolled-steel wheels, 33 inches in diameter, are used on the trailer trucks. The trailer truck axles have 4¼x8-inch journals, are 5¾ inches in diameter at the wheel fit, and tapered to 4¼ inches in diameter at the center.

The journal boxes are of the Symington M. C. B. type, with bronze journal bearings as in locomotive practice, and with wearing surfaces and the journal seat planed to template.

The brakes on both motor and trailer trucks are inside-hung. On the motor truck the brakes are hung from cast brackets riveted to the transom. The connection between the live lever and the crescent bar is by means of links straddling the wheels. On the trailer truck the brakes are hung from angles thrown across from the truck side frames, and the Davis brake beam is used.

The contact shoes are carried on maple beams, which are supported from the notched face of the extended equalizer spring seats, allowing for adjustment in height.

The motor and trailer trucks for 65 cars were built by the Baldwin Locomotive Works, and for three cars by the J. G. Brill Company.

Brakes.

The cars are equipped with hand brakes and with Westinghouse quick-service automatic airbrakes, schedule "AMT."

The motor-driven air compressor, with its governor, together with the whistle, are all of the General Electric Company's manufacture. The compressors are mounted on two oak planks, supported by a cradle of wrought-iron bars. The cradle is suspended beneath the car near the motor end and permanently bolted to the sills.

Motor and Control Equipment.

The electrical equipments were furnished and installed by the General Electric Company. There are two G. E.-69 motors of 200-horsepower on each car, while the control system is of the Sprague-General Electric automatic multiple-unit type. The controllers are so arranged that current is cut off from the motors throughout the train and the brakes are applied automatically should the motorman release his hold of the controller handle.

A large portion of the electrical apparatus was installed on the car bodies during their construction at the works of three car builders. All the cables for the electrical conduits are run in grounded loricated conduits, the outlets of which are provided with rubber-bushed bell-mouths. The greatest care and attention was given to all details of the conduit and wiring and all circuits were tested with high-potential alternating current after completion.

For the sake of brevity, these equipments will not be described in detail, as they are of standard General Electric design. With the exception that each car is provided with a trolley and third-rail shoe, the control system is similar to that on the 24 equipments supplied to the Boston Elevated road some eighteen months ago.

West Jersey & Seashore Railroad—View at Signal Bridge Showing Reactance Bonds in Track, Storage Battery and Relay Compartments.

Signal Equipment.

The signal equipment of the line was furnished by the Union Switch & Signal Company. There is a complete equipment of block signals and interlocking for switches and signals, either electro-pneumatic or manual, for all important stations not previously so equipped. Alternating-current track circuits from the running rails are used to control the automatic signals and air compressors at Camden and Newfield for furnishing pneumatic power are run by electric motors taking current from the third rail.

The signals from Camden to Newfield, 30 miles, and from Pleasantville to Atlantic City, 5½ miles, are automatic electro-pneumatic, while from Newfield to Pleasantville a telegraph block system is used with manual home signals and distant signals operated by electric motors. In the automatic signal section the blocks are about 4,000 feet long and in the non-automatic section about two miles. The standard arrangement of signals of the Pennsylvania Railroad governing speeds is followed: that is, when cleared the upper arm gives permission to proceed at full speed, the second arm to proceed at a limited speed, perhaps 40 miles an hour, and the lower arm, to proceed under control. At present no trains are permitted to run at unrestricted speed and the upper arm is fixed.

Reactance bonds have been made necessary on account of the double use of the rails for the propulsion and signaling currents. These are arranged and protected, as shown in the accompanying illustration, and they introduce in each rail a resistance for each block amounting to about the equivalent of 40 feet of 100-pound rail. The illustration referred to also shows the cupboard on the leg of the signal bridge containing storage battery and relays, and the box on the third rail contains the switches for charging the battery from the third rail.

The power-interlocking machines have a total of 85 lever spaces with 60 levers, distributed as follows: Glassboro, 29 spaces; West Haddonfield, 17; Newfield, 17; Starr Station, 11; and Van Hook street, 11. There are 17 manual interlocking machines: Camden, 24 spaces; Bulson street, 20; Gloucester, North, 20; Westville, 16; Woodbury "W," 44; Woodbury Heights, 12; South Glassboro, 28; Minotola, 20; Pleasantville, 32; Meadows, 24; Drawbridge, 16; Baltic avenue, 36; Atlantic City, 52; Winslow Junction, 12; Mt. Pleasant, 12; Delair "F S," 16; Delair "X N," 16. The total of working levers is 331.

Organization.

The conversion of the lines of the West Jersey & Seashore Railroad as described from steam to electric traction was carried out by the following organizations:

The construction of the terminals, inspection sheds, double tracking, changes in existing tracks, grading, new bridges, changes in telegraph lines and installation of a special telephone system were carried out by the regular engineering and maintenance of way departments of the Pennsylvania Railroad Company.

The installation of the interlocking plants and automatic block signalling was carried out by the Union Switch & Signal Company in accordance with plans of the signal department of the Pennsylvania Railroad Company.

The new cars and trucks required for the electric service were designed by the motive power department of the Pennsylvania Railroad Company.

The entire contract for the electrical equipment, including the construction of the power house, substations and the electrical equipment on the cars, was awarded to the General Electric Company, and in accordance with the plans and under the supervision of Mr. George Gibbs, chief engineer of electric traction, in consultation with the officers of the railroad company. Stern & Silverman, of Philadelphia, were appointed by the General Electric Company as its general subcontractor, and the Scofield Company, also of Philadelphia, acted as general engineer for the power house and subcontractor for the piling and foundations.

The whole of the electrical work was under the personal supervision of Mr. W. B. Potter, engineer railway engineering department General Electric Company, directly assisted by Mr. J. Elliot Hewes, Mr. C. E. Eveleth and Mr. W. H. Clapp.

On the lines of the Dayton (O.) & Troy Electric Railway Company, about 85 per cent of the passenger receipts is in tickets and 15 per cent in cash fares. Of the 85 per cent ticket business, approximately one-third is interline business. The rates are based on two cents per mile plus the odd cents necessary to make the price end in five or zero, and the round trip rate is twice the single fare less 10 per cent of the total. This company has 31 miles of interurban line and on its interline business its average haul is found to be 45 miles beyond its own lines.

DEPRECIATION AND RENEWALS FUNDS IN RELATION TO TRAMWAYS UNDERTAKINGS.*

BY MR. G. W. HOLFORD, GENERAL MANAGER SALFORD CORPORATION TRAMWAYS.

Having recently had occasion to report to my committee with reference to our "Depreciation and Renewals Funds," I forwarded to my colleagues, who have charge of the several undertakings in the country, certain queries upon the subject generally, and it was afterwards suggested to me that as the matter was one of very great importance to all those interested in municipal tramway work, this meeting of the association would form a fitting opportunity to introduce a discussion on the subject, and to lay before the members of the association in tabulated form the information which had been so kindly supplied to me. I need hardly say, gentlemen, that I was very pleased indeed to place my services at the disposal of the association, and I trust that whatever my short paper is lacking in merit, we shall find compensation therefor in the discussion which will afterwards follow.

In dealing with this subject, I would first respectfully impress upon you that I do not refer to depreciation in the same manner as it is usually dealt with in the balance sheet of a tramway undertaking, but more especially with regard to the provision of a fund to cover the cost of renewals which will be required in a municipal tramway undertaking before the period for which the borrowing powers have been allowed has expired. I have deemed it desirable for the purpose to divide the undertaking into the following branches, namely:

(a) Rolling stock;
(b) Buildings;
(c) Overhead equipment;
(d) Permanent way.

With regard to the first item, rolling stock, I am of opinion, taking into consideration the period generally sanctioned by the Board of Trade for repayment of money borrowed to cover this expenditure, that there will not be required within that period any abnormal expenditure for renewals, provided that careful attention is paid to the maintenance of the rolling stock. If this course is followed, the rolling stock should outlive the period of the borrowing powers.

Respecting buildings, these certainly also should outlive the period of the loans, and our standardized accounts already provide for their proper maintenance out of revenue account.

The next item, overhead equipment, is one also which I consider is maintainable out of revenue. I think it will be admitted that the poles will outlive the loan period, provided that they are painted at regular intervals, and although the trolley wire, etc., will, we know, require renewal from time to time, the cost of this periodical renewal is not a very serious item when we take into consideration the price obtainable for copper as scrap material.

I submit, therefore, that with regard to these three first-named branches, it is not necessary for a municipal tramways undertaking to establish a special renewals fund; but at the same time, whilst I state that I do not deem it a necessity to provide for depreciation, etc., in connection with these branches of the undertaking, I certainly would not advise any authority which has already established a fund for this purpose to discontinue the provision, as I am sure that good use will be found for the money in future years, if not for this identical object, for others, perhaps of greater importance.

I would, therefore, with your permission, confine my paper to the subject of the renewal of the tramway track or permanent way, which is, indeed, a very important branch of our several undertakings.

The two main points to be taken into consideration in dealing with this question are:

(1) The probable life of the rails;
(2) The probable cost of renewing the metals and relaying the track.

Embodied in the queries which I have before referred to was the following: If you have considered the question of the life of tramway rails, overhead equipment, cars, etc., I shall be pleased to hear your views thereon.

From a perusal of the replies which I have received, it is noticed that this point is one upon which few managers desire to venture an opinion at present, as the field of experience has not yet been of an extensive character, and much depends upon the method of construction and other local conditions;

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*Paper before the Municipal Tramways Association, Leeds. September 19-21, 1906. Discussion abstracted from the Tramway and Railway World, October 4, 1906.

but as far as I could gather from the opinions expressed, the life of the rail is estimated at, approximately, 12 years.

APPENDIX A.

SHOWING THE PROVISION MADE BY TRAMWAY UNDERTAKINGS WITH REGARD TO A DEPRECIATION AND RENEWALS FUND.

Town.	No. of Cars.	No. of Miles of Track	Annual Contribution to Depreciation and Renewals Fund.	Total Amount of such Fund at March 31, 1906.	ESTIMATED LIFE OF		
					Rails.	Cars.	Over-head.
Aberdeen	69	27¾	Whole of net profits	£14,379	15	15	15
Ashton	18	9	Nil	Nil	..	..	...
Ayr	17	7½	3% less cost of renewals.	£9,021	...	...	...
Barking	7	1¼	Nil	Nil	Period of loan.	...	Period of loan
Belfast	220	73	Not yet settled	Nil	20	..	...
Birkenhead	59	23¼	Whole of net profits	£11,465 17 5	...	...	...
Blackburn	48	23¾	Nil	Nil	23 20	20-15	...
Blackpool	61	21¼	No fixed amount ..	£6,342	‡	‡	‡
Bolton	86	42	Track, £360 per mile Overhead, 5%. Cars, etc., 10%. Depots, 3%.	£33,928	12½	10	20
Bournemouth	81	24¾	Nil	See note *	‡	‡	‡
Bradford	239	96	Whole of net profits	£48,169	15-12	Can be maintained out of revenue	
Brighton	50	17	Whole of net profits	£2,766	Cannot say.	Can be maintained out of revenue	
Burnley	46	19½	Whole of net profits	£11,796 11 8	...	.	...
Bury	41	23	Whole of net profits	£4,342 17 3	15	Can be maintained out of revenue	
Chester	12	4¾	Nil .	£539	...	...	
Colchester	18	8	Nil	Nil	..		.
Darlington	16	8	Nil	Nil †			..
Darwen	15	7½	£170 for cars	£5,250	20-15	15	Wire, 7 Poles, 25
Derby	39	8¾	Intended to use all profits.	£6,529	.	.	.
Doncaster	25	11	Nil	Nil			
Dundee	54	12¼	No fixed amount	£20,992			
Glasgow	783	158¾	Track, £500 per mile §Poles, etc., 3% Cars, 7½%. Depots, 2½%.	£905,253 11 1			
Gloucester	30	15	Nil	Nil			
Gt. Yarmouth	28	12	No fixed amount	£1,200			
Halifax	96	52	Whole of net profits	£10,221			
Huddersfield	70	30	3% of total capital expenditure.	£44,268	12	15	10
Hull	116	27	No fixed amount ...	£63,000	.		.
Ilford	22	6⅝	No fixed amount ...	£5,636			.
Keighley	10	6¼	Nil	Nil	15		
Kilmarnock	14	5	Nil	Nil			...
Kirkcaldy	22	7½	3% on cars & tools	£858	‡	‡	‡
Leeds	270	94¾	Track, £11,565 . Overhead, 2½% Cars, 5%. Depots, nil.	£118,493 9 9		.	
Leicester	140	36¾	Whole of net profits	£27,558		.	..
Lincoln	8	1¾	Nil .. .	Nil		.	.
Liverpool	479	103	No fixed amount	£214,398 ‖	Consider these amounts sufficient		
Lowestoft	20	5	Nil . .	Nil	.	.	.
Maidstone	7	2¼	Nil	£2,009	.	...	.
Manchester	542	142	Track, £100 per mile Overhead, £50 „ Cars, 5% Depots, nil.	£249,212	10	20	Maintainable out of revenue
Newcastle	187	57¼	No fixed amount	£28,658	12	Maintained out of revenue	
Newport	40	14½	No fixed amount	£1,000	15-7	...	...
Northampton	22	9¼	No fixed amount	£2,070	..	.	...
Oldham	80	35½	No fixed amount	£2,375 3 0	12	15	Line, 8 Poles, etc., 25
Preston	30	14	Act of Parliament provides that no contribution can be made to other funds until Renewals Fund amounts to £5,000	£4,000 ¶	..	.	
Pontypridd	12	5½	Nil	Nil			
Reading	36	13¼	Whole of net profits	£5,115		..	
Rochdale	52	28¼	Nil . .	Nil	20-15	20	Line, 10 Poles, 30
Rotherham	30	7	Whole of net profits	£1,980	5% on whole sufficient		
Salford	175	54¾	No fixed amount .	£30,439 7 3	15-10	Maintainable out of revenue	
Sheffield	257	66	£20,000 ..	£108,478 13 11	12-7	Equipment, 6	Line, 6
Southampton	49	16	Whole of net profits	Not stated	12	18	Line, 8
Southend	22	7	Nil	Nil	...		
Southport	26	19½	£1,053 . . .	£5,477			
Stockport	45	25	Whole of net profits	£5,941			.
Sunderland	64	19½	£6,400 .	£25,166		.	
Wallasey	35	12	1·47d. per car mile	£15,466			
Walsall	28	17½	Whole of net profits	£6,163		...	.
Warrington	21	6	Whole of net profits	£220			
West Ham	93	26	No fixed amount .	£10,092	.		
Wigan	67	20	Nil .	Nil			
Wolverh'mpt'n (Lorain system)	40	20	No fixed amount .	£13,498 5 3	12	10	

* Accumulated profit of £23,967 19s. 11d. not yet appropriated.

† Decided by Council not to provide fund until after third year of working.

‡ Under consideration.

§ Nothing for overhead wire, which is maintained out of revenue.

‖ £50,639 set aside last year.

¶ Intended for some years to place all net profits to reserve fund.

In connection with the congress of the International Tramway Association at Milan in the present month, a number of queries were issued to the various tramway authorities on the continent, and a portion of one of these queries directly bears upon the subject now under consideration. The one I refer to is as follows, namely:

"What is the average life of your tracks, and of your rails; (1) in sections of straight line with light traffic or heavy traffic; (2) and on curves with feeble or heavy traffic."

From a perusal of the replies of the various continental tramway authorities, it will be found that the general estimate of the life of a rail over which the traffic is fairly light—that is, not less than every five minutes—would average out at about 15 years, and that on a line where the traffic is heavy at about 10 years.

In my own opinion, after a careful study of the subject, and from a number of measurements I have taken of the wear so far on numerous portions of our rails, I came to the conclusion that these figures were the most desirable to adopt, and in reporting to my committee I base my calculations thereon.

Before leaving this portion of the subject, relating to the probable life of the rails, I would desire to specially mention two points which came to my notice, the first being the excess in wear which was found at the rail ends as compared with that about 3 feet away, and secondly that in grinding the rails to take out corrugation we had to reduce the thickness by nearly one-sixteenth of an inch, which means a lessening of the life of the rail of probably one year, and if the corrugation returns this may possibly have an important bearing on the question of the date at which the renewals will be required.

With regard to excessive wear at the rail ends, the means we have so far adopted in dealing with this is to weld the joint by the thermit process. No doubt other gentlemen who have had wider experience on this subject will, in the discussion to follow, provide us with some valuable advice and information thereon.

I now arrive at the second portion of the question of renewals, which is the probable cost that will be incurred in providing new rails, etc., and in relaying the track.

On this point I am able to speak with greater degree of certainty, as the laying of practically the whole of our tramway track was carried out under the immediate control of the department, and a careful record was kept of the work.

It was found that for the reconstruction work, with a concrete bed throughout and using new granite setts, the average cost was about £6,500 per mile of single track. This figure may appear somewhat high, but it must be remembered that whilst the reconstruction was taking place in most cases the service of the cars had to be maintained, and this will occur again when the renewals are required to be made.

In the case where new setts were not used, the cost was approximately £4,930 per mile of single track.

It should be borne in mind that it will not be necessary to reconstruct a new concrete bed throughout, and in consideration of this fact the cost of the work will be lessened by, approximately, a further sum of £600, leaving the amount at £4,300; but this will further be reduced, as the old rails taken up will certainly be worth, as scrap material, not less than £2 per ton, and as there will be approximately 160 tons of metal to be taken from each single mile of track, a further reduction will take place to the extent of £320, leaving the net cost of the work at £4,010—say £4,000—which I consider is a fairly high figure, and no doubt may possibly be still further reduced when the time arrives to carry out the work.

Taking this figure, however, of £4,000 for our calculation, it means that, in order to provide an adequate fund for the future expenditure to be incurred in the renewal of the track, it is necesary and desirable to set aside annually a sum of £400 in respect of each single mile of tramway with an estimated life of 10 years, and £267 in respect of each mile of tramway with an estimated life of 15 years.

The total amount of the annual contribution will have to be increased each year pro rata to the increase in the mileage of track added from time to time which is maintainable by the authorities respectively.

I would desire before concluding to call the attention of those present to the information contained in the tabulated statements appended to this paper, and particularly to the varied methods which have been adopted by the several tramway undertakings in dealing with the establishment of a depreciation and renewals fund; in one instance it will be noticed that the annual contribution to the fund is calculated on a car-mileage basis, and it will be very interesting to hear the reasons which led to the adoption of this particular method. In several instances, so far as my humble judgment guides me, I feel sure that ample provision is being made for the expenditure that will have to be met in a few years time; in other instances, the authorities have been of a perhaps too generous spirit, and whilst making handsome contributions to the relief of the rates in their respective cities and towns, have hardly dealt as they ought with the provision of an adequate depreciation and renewals fund. Many undertakings, particularly the smaller ones, have, I regret to say, so far been unable to establish any fund. In conclusion, I would desire to earnestly impress upon those gentlemen responsible for the control of the undertakings in which proper provision is not being made the very serious results which will follow in some ten or twelve years' time, when, owing to the non-provision or insufficient provision of such a fund, heavy calls will inevitably have to be then made upon the rate-payers to meet the requisite expenditure for the work, causing great dissatisfaction and no doubt strong adverse criticism of municipal management, which may result in a serious set-back to municipal progress for many years to follow.

APPENDIX B.

Containing Information from Continental Tramway Undertakings on the Subject of the Probable Duration of Rails.

City or Town.	Estimated Life of Rails.	
	On, Straight Line Light Traffic.	On Straight Line Heavy Traffic.
Aachen	18	15
Amsterdam	20	8
Basle	14	10
Gros Berliner	12—10	8—5
Bochum Gelsenkirchen	20—10	..
Bremen	12—10	10
Breslau	15	10—8
Crefeld	15	10
Dresden	20—15	12 10
Dusseldorf	18—15	15—10
Barmen Elberfeld	15	..
Geneva	30—15	25—10
Hamburg	16	12
Hanover	20	14
Havre	..	10
Konigsberg	20	..
Copenhagen	20—10	10—5
Christiania	18	14
Leipsic	16—15	12—10
Liege	12	..
Lyons	20	12—10
Metz	15 -13	10—8
Paris	..	15—12
East Parisian	20	10
St Gall	10—8	..
Stuttgart	20—15	..
Turin	25	20

N.B.—All the above undertakings are worked by electric traction.

Discussion on Mr. Holford's Paper.

Alderman A. J. McCormick (Belfast Tramways Committee) said in part: I have some difficulty in agreeing with the gentleman in all the detailed parts of the policy that he there indicates. His general conclusion, as I understand it, is that a sum of £400 per mile per annum ought to be laid aside for purposes of depreciation in respect of the permanent way. In the case of Belfast, that would impose a very considerable charge indeed. Our lines extend over 70 miles; to apply those figures to those 70 miles would mean we should require to lay aside the sum of upwards of £28,000 per year. In our present state of development, at all events, I see no prospect of doing that. I think in the central districts the wear and tear is much greater than in the suburbs. I think the lines might be divided in this way. There is a heavy wear in the center, in several districts a medium wear, and in other districts a light wear. Instead of applying £400 per year, I think it might be divided into two, and that if a sum of £200 were laid aside it would reduce the burden of the corporation. In the case of Belfast, we might fix upon a sum of £12,000 or £13,000; but to have to fix upon £20,000 or £30,000 would be beyond the possibilities—at least, more than any possibilities which up to the present have shown themselves. In the case of wealthy corporations—corporations that have been long in possession of their tramway systems, and have made large sums of money—in cases of that kind, they might reasonably allow a great deal more than a corporation such as the Belfast Corporation is in a position to do. Even then I think great care should be taken, and that too great a burden should not be imposed on the present generation in respect of this matter, because we ought to never lose sight of the fact that the sinking fund is in a large measure the depreciation fund; in other words, that at the expiration of a certain year the entire difference is wiped out, and the corporation is in a much better position than it was at the commencement. I think that, generally, when the difference is applied to the ordinary mercantile concern, where the sinking fund is used, or has been introduced into the company, they seldom provide an addition to their depreciation fund. I think, having regard to the fact that many corporations are only commencing their tramways undertaking, and are more or less handicapped at the particular stages, they should not unduly burden themselves in respect of a heavy depreciation fund. I agree with the general conclusion that they should show foresight in regard to these matters, particularly having regard to the fact that a system may become obsolete, and consequently some provision ought to be made; but I think too much importance is attached to the question of depreciation.

Mr. R. Rugg Monk (Plymouth): It is a point whether, in addition to paying interest and sinking fund and keeping up repairs on your line, your overhead equipment or rolling stock—all out of revenue—it is necessary to provide a depreciation fund also. It strikes me that you are doing as much as can be expected if you are keeping up the maintenance of the cars and overhead equipment out of revenue, and that you cannot be expected to do more. You cannot have your cake and eat it. I am proud to say during the five yeras I have been chairman I was able to clear off a difference of £5,200. Ours was an early undertaking; we had to buy up a horse system, and we afterwards electrified it; consequently there was a sum spent of about £8,000, which is all cleared off. I want to know how we are to manage with any surplus. Are we to put by depreciation as well as to carry out the method I have indicated?

Councillor Flint (Leicester): I was surprised to find a score of our towns making no provision for depreciation. I am afraid they are preparing a rod for their own backs; unfortunately some af the other corporations will get the benefit of the rod. Those of us who are strongly in favor of municipalization of our tramways and some other undertakings are most anxious they should be placed on a sound footing. Some of our corporation committees are dividing their revenue and having a depreciation fund and a renewal fund also. There is room to discuss whether it is advisable or not. Of course, the sinking fund is a depreciation; how far we should supplement that by another is a matter for you to discuss; personally, I do not think there is much need for it, but so far as the renewal fund is concerned I think there can only be one opinion. We have not an experience that will justify us in assuming that we are going to meet our responsibilities with a light heart. We do not yet really know how great these responsibilities will be, and, as wise men looking to the future, we are compelled—those of us who want to lead the corporations in these matters—to provide against anything that may arise. We have not had any very serious accidents in some of our towns. Great claims may be made upon us and our just duty is to provide for them. Then our rolling stock has been mentioned, and many of us have our generating plant to consider. I think the sum mentioned—£400 per mile—is rather excessive. Any two towns would not agree upon that; half the amount would be nearer the approximate risk for those who have to prepare also for the maintenance of the generating plant, but I would urge here that all those corporations or tramway authorities who have not yet commenced to put by a reserve fund should start at once, for the sake not only of our own people, but for the sake of those who may come after us.

Mr. Peter Fisher (general manager, Dundee Corporation Tramways): It is not a question of how much we are able to set aside, but the amount that is necessary to set aside to ensure that our undertakings are on a sound financial basis. I quite agree with most that has been said in this paper. Some of us who have had to face the assessors claiming exemption and abatement, have argued that we require about £400 per mile laid aside for depreciation or for renewal of track. I should not like that these government men—themselves assessors—should hear what has been said here today, that £200 is sufficient. We argued that a great deal more is required, and we are able to get allowances for over £200. They are allowing, in some cases, £500 per mile of single track as the correct sum required for renewals. We are laying aside on 20 miles of single track something between £4,000 and £6,000 per annum. The assessor says he is willing to allow £6,000. He considers it not more than ample to make sure and certain that when the time for renewal comes we have allowed sufficient money, and by having that money it assures that these allowances from these assessments are kept constant, while, if we are not making ample allowances year by year, and the time came when renewals had to be made, our assessments would have dissappeared, and the work of the assessor would appear not to have been well carried out. These are the views of the assessors, the government men, as well as the assessor of railways in Scotland. He has studied the question, and he knows something about what the sum is that is likely to meet real expenditure in the renewal of the permanent way, etc. That is the point I wish to bring before you. It is not a question of what we are able to lay aside, but what is a sufficient sum, and I have pointed out these assessors, who are well qualified to judge in this matter, allow as large a sum as the peper suggests should be laid aside.

Mr. Sellon: I must say that as regards the gentleman from Belfast I think this paper will be an exceedingly valuable one, because as far as I can see I am afraid Belfast is beginning very badly. They have opened their line and depreciation has commenced, and they begin to think they ought not to put aside as much as they ought to do. There is one point I am going to suggest to the author of this paper, viz., that he has made—in making a statement that if a line is going to cost £4,000 for renewals, and lasts ten years, it requires a sum of £400 per annum to be put aside to make those renewals—rather an error. He has forgotten that people in this world are able to put aside money and get interest for it, and that therefore, instead of putting aside £400 per mile, he must calculate the sum he would have to put out at say 3½ per cent which will make the amount necessary for that purpose. There is one point on which I think a very great mistake is made, that is—and I have noticed it constantly—that I do not think the words "sinking fund" are quite understood. Sinking fund is not a depreciation fund, nor can it ever be. A sinking fund simply means a sum of money put aside, so that when a term of years for which money is borrowed for a specific purpose has expired that money has been paid back. Everybody knows depreciation is a different thing, because depreciation means the keeping up or renewing of your material before that time has expired, because if you borrow money for twenty years some of your materials will have worn out before that date, and therefore the renewal fund, or depreciation fund, is absolutely necessary, and it must not be considered as a sinking fund.

Mr. H. E. Blain (general manager of West Ham Tramways) related the incident of the gentleman who contended that posterity had never done anything for him, and, therefore, he did not see why he should do anything for posterity. Continuing, he said: I think there should be some via media between the example which has been set by Glasgow, which always has more money than it knows what to do with, and which seems to put aside as much money as it can, and rightly so, as a reserve and depreciation fund, and in other places. We have in the sinking fund, as has been pointed out by Mr. Sellon himself, a fund which at the end of the borrowing period will wipe out the whole of the money that has been borrowed. If, in the meantime, the whole of the maintenance has been done, as it is being done by many of the municipal tramways in the country, out of the revenue account, it does seem to me that, so far as the reserve and renewal fund is concerned, it should be sufficient for that fund to be accumulated to a sufficient extent to meet the life of any portion of the capital expenditure which would expire in a less period than that for which borrowing has taken place. With regard to overhead equipment, for instance, I do not think it would be considered for one moment that there is any likelihood of any demand being made upon the reserve fund in connection with the overhead equipment. That would certainly be maintained every year out of the revenue account. With regard to the cars, that I admit is a debatable point. It does seem, if the cars were maintained as efficiently as they are in many undertakings in the country, that a very great outlay should not be necessary with regard to the cars within the period for which the loan has been borrowed. This brings us then to the permanent way as being the principal item which must be safeguarded, and the amount of £400 seems to be rather high for permanent way which has been laid down under modern practice. I would venture to ask for opinions as to whether a sum of about £300 would not be considered sufficient, with compound interest, to cover the permanent way. As I ventured to suggest, I think the other items would take care of themselves out of the ordinary revenue account. There is one question with regard to the permanent way I should like to ask of those managers and engineers who have been running systems a long time. We in West Ham have been making some very exhaustive experiments with regard to radial trucks, and one conclusion I have come to in connection with those experiments is rather an extraordinary one. I throw out the question with the greatest hesitation, whether the real saving in connection with permanent way, arising from the use of radial trucks, is not obtained upon the straight rather than upon the curve? We have been taking out some experimental diagrams with radial trucks. It has been really astounding to see the variation which takes place on a track which is presumably straight.

Mr. Dalrymple (general manager Glasgow Corporation Tramways): After the remarks of Mr. Blain I must put the corporation of Glasgow right. I say most emphatically that the corporation of Glasgow has never set aside one single penny more than they considered necessary to meet the renewal and depreciation. You must remember that we calculate what is necessary, and we set aside that and no more. In regard to the other points raised by Mr. Blain, I have always looked upon a municipal corporation very much as I look upon an individual who borrows say £1,000 to start business with, and who says "I must pay that thousand pounds back again before I am a free man—the business is not mine." I look upon the business of tramways started by corporations just in the same way as an individual starting business, and I think the first duty of a corporation is that it should free its feet of debt, because the business does not belong to it until that day comes around. Therefore I approve altogether and entirely of the remarks made by Mr. Sellon that a sinking fund has nothing to do with a depreciation fund. That is our principle in Scotland, but I know for a fact that in England the municipalities are looking to the day when their track goes down, and when they will go to Parliament and say "Our track is down, we want to reborrow the money we borrowed before." I say that is a mistake altogether.

Mr. Andrew Nance (general manager Belfast Corporation Tramways): An issue has been raised now which I think we have got to meet. The suggestion of Mr. Dalrymple is that we are to get no benefit until at the end of 30 years, because the corporation is not free of debt. I want to say to the association how I think the tramway committees stand in respect to the corporation today. They stand very much in the position of a man who takes a repairing lease on a property. He is bound at the end of his term to hand over that property in good repair and fit for somebody else to occupy, and that is all. And, therefore, what does he do? He keeps it in good repair as he goes along and, if he is a wise man, he puts aside something and creates a little fund, so that when the valuers come and tell him what the dilapidations are he will not have to put his hand in his pocket, or sell out his stock, but he has got it ready to pay out. That is the position which I think the tramway committee should be in towards the corporation at large. I do protest against the principle of robbing the present generation for the sake of the future. Put aside enough to be safe. I am speaking to practical men now. I say to you keep up your undertaking, as I hope all of you do, to concert pitch—the overhead work, the buildings, the cars—I say boldly the cars, for there is no part of a tram car that cannot be renewed out of revenue. I will go further than that and say the electrical equipment also, for you must keep your engines in order; you must keep all their wearable parts—that is, the smaller parts—you must keep all those parts in perfect order or you cannot be certain that you will not get a message from the electrical department that the current is stopped. When you can do these things it reduces, as several speakers have said, the depreciation to the cost of maintaining the permanent way. It is no good exaggerating the cost of renewing the permanent way. It is perfectly true you must have a sum which is inviolate, so that when the time comes the general manager can dip his hand into it; but it is no good putting aside too large a sum. I know something about it. I have been laying and relaying permanent way for 25 years, and I know something about the cost. I relaid 30 miles of track with 90-pound girder rail, I put in 25 per cent of new setts and 75 per cent of redressed setts, and it cost me £1,680 a mile run. Very well, that was some time ago, and wages and materials have gone up. I do not see the use of putting down £4,000 a mile. With regard to the life of the track, I divide the track into four sections, the junctions and the curves have to be relaid constantly—some of the curves too constantly—out of revenue. I do not mean that you do not want any money set aside for them—you must relay them as they come out. Then there is the heavily worn track. Eight years I give as the life of that, of the medium track 12 years, of the light track 15 years. Now, gentlemen, £200 a year set aside especially to provide a fund for putting your permanent way right, will be, in my opinion, a very safe sum. That is the last word I am going to say, gentlemen. This absolutely necessary fund should be created at the start and carried on regularly at any cost; but don't put it at too high a figure or you are robbing the present generation for the sake of the future.

Mr. Holford, in reply, said in part: Mr. Fisher, I consider, struck the right keynote of the paper when he stated that it is not a question of what undertakings can afford to set aside, but as to what amount they ought to set aside for renewals, etc. In our own case at Salford we are not yet setting aside a sufficient sum for renewals, but we are hoping to be in a position to do so at no distant date. There is considerable force in his reference also to the effect this question bears in relation to rating and income tax rebatement, etc. I am much obliged to Mr. Sellon for his explicit definition of sinking funds, as I know that this is a point which is somewhat misunderstood by a number of people having to deal with tramway undertakings. They seem to have in their mind that when the permanent way requires renewal they will be able to obtain from Parliament fresh borrowing powers for this purpose, in consideration of the amount they will by then have paid into the sinking fund. In my opinion this view is quite incorrect, and I may say that I am speaking after consultation with eminent legal gentlemen upon the matter. Neither the Board of Trade nor Parliament will, I feel sure, grant fresh borrowing powers for this expenditure, until the whole of the money originally borrowed for constructing the tramways has been repaid. I should just like to refer to Mr. Sellon's point suggesting that I have overlooked the fact of money accumulating with interest, etc. Mr. Sellon is perhaps thinking of the way in which a company would deal with such a fund, but it is somewhat different in a municipal undertaking. I have just inquired and am informed that in Glasgow and Manchester, and I know that in several other large undertakings, they transfer a fixed amount per mile to the renewals fund each year, and that whatever interest may have accrued is not credited to that fund, but to the general revenue account of the whole undertaking. I quite agree that if the fund could be allowed to accumulate its own interest a much less figure than the one I state in my paper would be sufficient. There is only one further remark I would wish to make, and that is with respect to the figure Mr. Nance submits as the probable cost of reconstruction. The figures I set out in my paper are based on actual cost of tramways construction for electrical traction, and I am quite sure that when the time comes for the Belfast lines to be relaid it will be found that the figures mentioned by Mr. Nance are very much below the actual cost that will be then incurred in carrying out the work. I am much obliged to the gentlemen who have taken part in the discussion, and as it has been arranged that those gentlemen who are very anxious to contribute to the debate, but whom time has not permitted to do so, will forward their views in writing to the secretary, I hope to have the pleasurable duty in due course of replying to them.

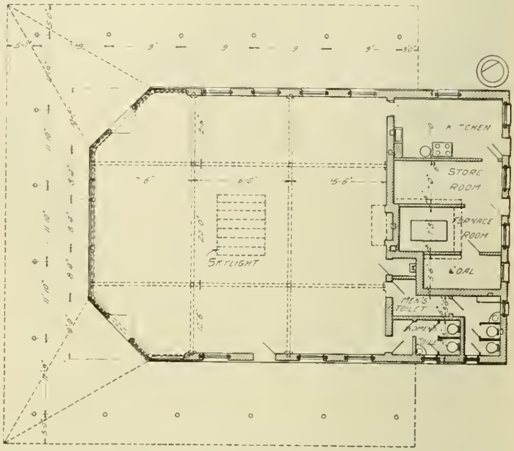
Splicing Broken Armature Parts.

A method of splicing broken armature shafts that is proving satisfactory has been developed at the Columbus, O., shops of the Indiana Columbus & Eastern Traction Company. Shafts broken near the gear or on the taper at the pinion end are easily repaired so that the armature may be used until it is necessary to tear down the winding for some other reason.

The method of making the splice is simple. The broken end of the shaft is turned down in the form of a cone, longitudinal grooves being cut in its surface. After this is done another piece of shaft steel is hollowed out, cup-shape, to fit the taper snugly. One-fourth of an inch of spelter is placed in the bottom of the cup. The two parts are fitted together and placed in a screw jack or wheel press and are then heated by means of a coke air-blast flame which is made to circle around the shaft. As the parts to be spliced are heated pressure is applied through the screw jack and the spelter is forced from the bottom of the cup to all parts of the taper. When the shoulders of the two pieces are brought together the weld is complete. The shaft is then placed in the lathe centers and trued. The method described has been used very successfully and in many instances the welded shafts are still in use after several months of severe wear.

NEW WAITING STATION, SOUTH CHICAGO CITY RAILWAY.

The South Chicago City Railway Company has recently completed a new waiting-station situated on Madison avenue just south of Sixty-third street, Chicago, which not only adequately serves the purpose for which it was intended but is believed to be one of the finest and most convenient stations of its size in the country.



New Waiting Station for the South Chicago City Railway—Plan View.

The South Chicago City Railway Company owns 37½ miles of track, and operating in connection with the Hammond Whiting & East Chicago Electric Railway serves the district adjacent to Lake Michigan, extending from Sixty-third street and Madison avenue south to South Chicago, South Deering and across the Illinois-Indiana state line to Hammond, Whiting and East Chicago. The Hammond Whiting & East Chicago company owns the lines in Indiana, although no transfer is required at the state line. A 20-minute service is given between Sixty-third street and South Chicago and South Deering, and also to Hammond and East Chicago. At the northern terminus the lines connect with those of the Chicago City Railway, the South Side Elevated Railroad and the Illinois Central Railroad, and the new station was provided for the convenience of the large number of passengers who are obliged to wait for cars at this con-

New Waiting Station for the South Chicago City Railway.

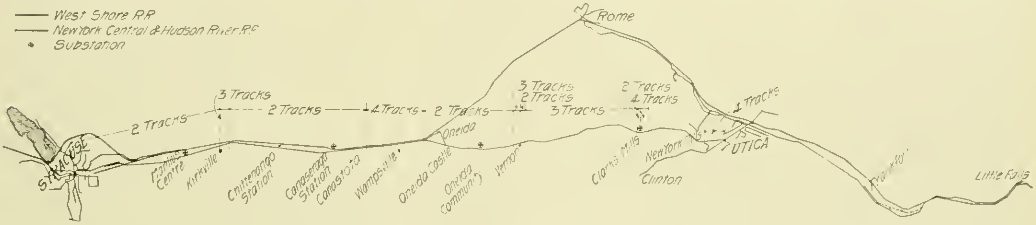
necting point. The tracks are looped around the building, arriving at one side and leaving at the other.

The station, of which a ground-plan and an engraving from a photograph are presented herewith, is 45 feet wide, 70 feet long and 23 feet high, and is in the form of a rectangle, with the front corners cut off at an angle of 45 degrees. The building is constructed throughout of the best quality of red pressed brick, with stone and concrete foundations, concrete floor and a gravel roof. The walls extend up five feet above the roof in front and are finished with a heavy galvanized iron cornice. A corrugated iron shelter roof 10 feet 10 inches wide extends across the front of the building and two-thirds of the way around on each side, supported by steel columns. The building is entirely surrounded by a wide concrete floor with a slight pitch so it can be easily flushed. Heavy plate glass windows extend across the entire front of the building. The interior walls are of pressed brick the same as the outside, without any interior finish, but relieved by panels. The roof structure is of 9-inch and 12-inch timbers, supported by 7-inch circular steel columns. The ceiling is finished in Georgia pine. In the center of the roof is a skylight 8 feet x 10 feet, with permanently opened ventilators. The floor inside has a slight pitch and three bell-trap drains so that it can be easily flushed. At the sides and corners the floor is rounded up slightly to meet the walls, so as not to leave any sharp corners where dirt may lodge. The waiting room, 50 feet deep, occupies the front of the building, and contains a fruit stand, cigar stand, soda fountain, etc. The counters extend around the walls on all four sides.

Plenty of benches are supplied for the convenience of passengers, but in the summer most of these are placed outside under the shelter, and the proprietor of the refreshment stands is allowed to set tables in the waiting room. The rear 20 feet of the building is divided into separate rooms, a kitchen, store room, furnace room, coal bins, and toilet rooms.

The building is heated by hot water from a Spence heater located in a pit six feet below the floor of the furnace room. The supply pipes run between the ceiling and the roof and the return pipes run under the concrete floor, in tiling with a dead air space, so that very little heat is lost. Direct current is supplied for the lighting system at 550 volts and there are three series arc lights inside the building and two outside. There are also 16 sets of five 16-candlepower series incandescent lamps inside and three outside under the shelter roof. All wires are led through conduits and are grounded outside of the building. The plans for this station were suggested by Mr. George R. Folds, general manager of the South Chicago City Railway Company. The architect was Mr. F. W. Fischer, of Chicago.

The Seattle Electric Company has increased the wages of its conductors and motormen one cent an hour, and those of its gripmen, two cents an hour, so that the gripmen now receive one cent an hour more than the others. Under the new scale the maximum wages are received after 15 years' service instead of 18 as formerly.



Electrical Equipment of West Shore Tracks—Map of Routes.

ELECTRICAL EQUIPMENT OF THE WEST SHORE.

The interests known as the Andrews-Vanderbilt Syndicate are now engaged on an important piece of work in connection with the equipment for electrical operation of the section of the West Shore Railroad between Utica and Syracuse, N. Y. Common ownership of the local street railways in the principal cities in central New York and of interurban lines connecting several of them naturally required the building of an electric railway between Utica and Syracuse, and a route independent of existing steam railways had been surveyed when the community of interest established between the New York Central and what are now known as the Andrews-Vanderbilt electric lines made it practicable to equip portions of the West Shore for electrical operation. The great advantage of this arrangement is the conservation of capital by avoiding unnecessary duplication of tracks.

The work in hand covers that portion of the West Shore between the city limits of Syracuse and the crossing of the railroad and Genesee street in Utica. This distance is 44 miles. The distance from the center of Utica and the center of Syracuse is 48.6 miles. The passenger schedule provides for limited trains in each direction leaving on the even hours and making the distance from downtown terminal to downtown terminal in 1 hour and 22 minutes, and trains each way leaving on the half-hour, making the run in 1 hour and 52 minutes, this latter service caring for local traffic.

The relative merits of alternating-current overhead equipment and the third rail were carefully considered, and the decision to install the third-rail, direct-current system, was largely determined by the greater flexibility of a third rail should it become desirable to make lateral extensions, install additional side tracks, switches, etc. The passenger schedule contemplated, taken in connection with the freight traffic which the West Shore would handle with steam-operated trains, required that one or two additional tracks be built over certain sections of the line. Reference to the map will show where these additional tracks are located. These additional tracks will enable the passenger trains operated by electricity at 55 and 45 miles per hour, respectively, to avoid interference with the freight trains operated by steam, which are of two classes, fast freights with schedule of about 25 miles per hour and local freights with a schedule of about 15 miles per hour.

For the purpose of construction the line has been made into four subdivisions. These are:

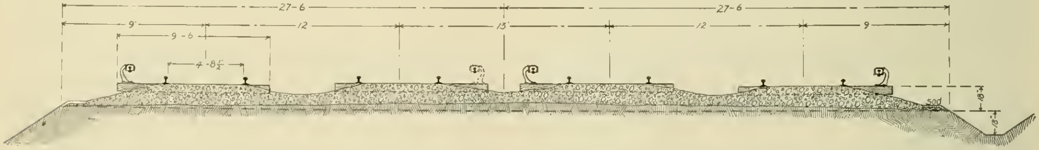
1. Genesee street in Utica to Vernon grade, 11.3 miles long, with a total of 31 miles of track.
2. Vernon grade to Lenox avenue, Oneida, 10 miles long, with 24.5 miles of track.
3. Lenox avenue, Oneida, to Chittenango, 10.3 miles long, with 26.6 miles of track.
4. Chittenango to Syracuse city limits, 12.5 miles long, with 25.6 miles of track.

Work was started on May 15 and by August the installation of the third rail was practically complete on the first section. The electrical equipment of the West Shore is being done by the Oneida Railway Company of Oneida, a corporation organized under the earlier railroad laws and having a more liberal charter than could be obtained were a new corporation to be organized at this time. One of the most valuable rights of the company is that to extend its lines. The terms on which the Oneida Railway Company will use the West Shore tracks have not been agreed upon, but a contract has been made under which, after one year of operation, the companies in interest agree to execute an operating agreement. Mr. C. Loomis Allen, general manager, and Mr. W. J. Harvie, electrical engineer, of the Utica & Mohawk Valley Railway Company of Utica, are also general manager and electrical engineer, respectively, of the Oneida Railway Company, and in that capacity have direction of the West Shore work.

The Oneida Railway Company has contracted with the Hudson River Electric Power Company for the delivery of three-phase current at a potential of 60,000 volts at the Oneida Railway Company's substation at Clarks Mills, about seven miles west of Utica. The Hudson River Electric Power Company will for the present generate this current at its auxiliary steam plant in Utica. Upon the completion of its transmission lines current later will undoubtedly be taken from hydro-electric plants owned by this company in the eastern part of the state. The Oneida Railway Company is building four substations located about 10½ miles apart. These, counting west from Utica, are located at Clarks Mills, at a point 1½ miles west of Vernon, at a point 2½ miles west of Canastota, and at Manlius Center, which is 5½ miles east of the Syracuse city limits. These substations will be identical in construction and each will be equipped with two 300-kilowatt rotary converters and the necessary equipment for transforming 60,000-volt three-phase current to direct current for distribution to the rail at 600 volts.

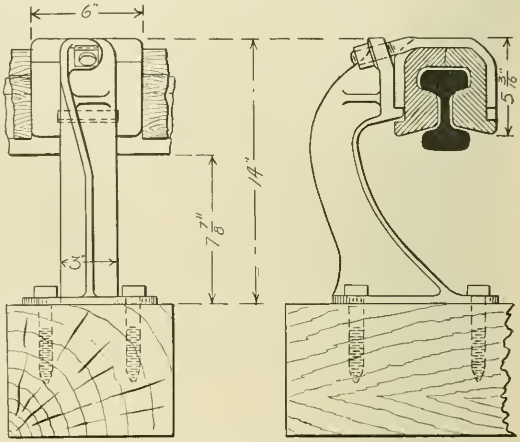
The transmission line connecting the company's substations will be of No. 0 stranded copper cable supported on narrow base steel towers. The towers will be built by the Archbold-Brady Company of Syracuse and will be very similar in design to those built by the same company for the Syracuse Rapid Transit Railway Company. There are to be 391 of these towers with a normal spacing of 480 feet. The great majority of the towers are 39 feet high; the highest are 63 feet, measuring from the top of the foundation to the bottom insulators. The insulators are to be R. Thomas & Sons No. 4008; this is a four-petticoat insulator 13½ inches high over all and with 14 inches maximum diameter. The three conductors will be at the vertices of an equilateral triangle 7 feet on a side.

The third-rail construction is the Wilgus underrunning protected type, which is the standard adopted by the New York Central. The rail was furnished by the Lackawanna Steel Company and is a double-headed section, 4 3-16 inches high and 2 9-16 inches wide, weighing 70 pounds to the yard. The rail protection adopted is of two types. For all but 10 miles the protection is of yellow pine designed to give at least 1¼ inches of wood above the rail and on both sides. On ten miles of the third rail the protection is of fibre 3-16 inches thick moulded to conform to the outline of the rail section and sufficiently flexible to permit lengths of this to be slipped over the top head of the rail. The fibre covering was furnished by the United Indurated Fibre Company of Lockport, N. Y.



Electrical Equipment of West Shore Tracks—Cross Section of Four-Track Roadway.

The ties for the third rail are 7x9 inches in cross-section and 9 feet 6 inches long and are spaced 11 feet between centers. To each tie is bolted a cast iron bracket, to the top of which the third-rail insulators are fastened by a T-headed, drop-forged, steel hook bolt. The details of the supporting bracket, hook bolt, insulator and rail are shown in the accompanying engravings. The insulators are of porcelain 6 inches long made in halves. The half near the bracket is supported vertically by a lug made on the casting, the vertical support for the other half being the T-head of the hook bolt which fits into a recess in the side of the insulator. The horizontal cross support is given by the hook bolt, which, fitting into the groove around the insulator, also prevents motion of the insulator in the direction of the rail. These insulators were furnished by the Ohio Brass Company, except a sample order supplied by the Diamond Porcelain Company.



Electrical Equipment of West Shore Tracks—Details of Third Rail Support.

The third rail is placed between the two parallel tracks except at curves or where other special conditions require the third rail to be transferred to the other side of the track. The center of the under surface of the third rail is 2¾ inches above the top of the track rail and 32 inches from the track gauge line. The brackets are designed so that the use of 80-pound track rail will bring the contact surface of the conductor rail 2¾ inches above the track rail, and hence it is denominated an 80-pound bracket. The end blocks for guiding the shoe in making and breaking contact with the third rail at gaps are of cast iron 7 feet long, and are supported three feet from the end in an insulator similar to that used on the steel rail, but modified to conform to the shallower section of the tapering approach block. The wooden protection is carried out over the approach block and projects an inch at the end.

The bonding of the conductor rails is with two 16-inch 500,000-circular mil Roebling bonds at each joint. These bonds are of the soldered type. John A. Roebling Sons Company also furnished the crossing connections at gaps in the third rail. These will be of 1,000,000-circular mil cable, laid in 3-inch galvanized iron pipes. Bonds for the track rail are of the Ohio Brass all-wire type, 11 inches long between terminals and of 250,000-circular mil cross section. While the bulk of the track bonds were furnished by the Ohio Brass Company, John A. Roebling Sons Company, the Electric Service Supplies Company, the General Electric Company and the American Steel & Wire Company each furnished 1,000 track bonds.

At 16 points on the line there are switches or crossings, the totals being 38 switches, 21 crossovers and 4 railroad crossings.

The total length of double-track line is 151,700 feet; of three-track line, 49,900 feet; and of four-track line, 30,400 feet; a total of 232,000 feet, or 43.9 miles. Measured as single track the total is 108.8 miles. These figures do not include the electric railway tracks over which cars reach the downtown districts in Utica and Syracuse.

The Oneida Railway Company has ordered from the J. G. Brill Company 15 closed cars. These are 49 feet over the bumpers, 48 feet over the crown pieces and 40 feet over the body sheathing. The width is 8 feet 6 inches. The body of the car is divided into two compartments, the main compartment being 28 feet 3 inches long, with 19 double seats. The smoking compartment has 7 double seats. The cars are to be mounted on Brill 27E 2 trucks of 5 feet 6 inches wheel base, spaced 29 feet 6 inches between truck centers, making a total wheel base of 36 feet. The motor equipment will comprise four G. E. 73 motors per car. The control is the Sprague-General Electric multiple-unit type.

New England Street Railway Club.

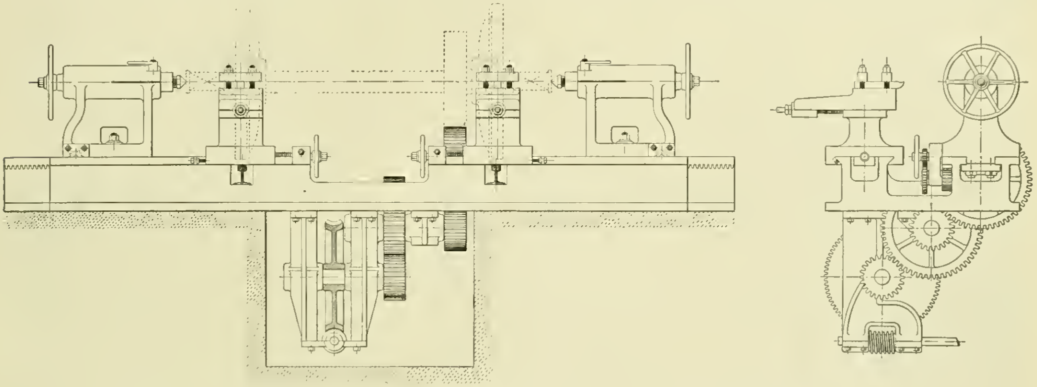
Prof. H. E. Clifford of the Massachusetts Institute of Technology was the speaker at the first meeting of the New England Street Railway Club this fall, which was held at Boston on October 25. His subject was "Modern Illuminants." Examples of the latest and earlier types of arc and incandescent lamps were shown in operation, and the characteristics of each discussed. Part of the lecture was a review of the historical development of electric lighting, and at the end a strong plea was made in favor of applying engineering methods to the use of the modern lamp of high efficiency.

Incandescent lamps of the metallized, tantalum and tungsten filament types were shown, but at present the only satisfactory one for railway service seems to be either the ordinary carbon filament lamp, or the metallized filament. The newer lamps as a rule are not equal to the shocks imposed by rough handling, but the careful study which is being made in the laboratories of the manufacturers leads one to expect further progress. Mercury vapor lamps were also discussed.

A LATHE FOR TURNING CAR WHEELS WHILE IN PLACE.

Mr. James Warren, master mechanic of the Indiana Columbus & Eastern Traction Company, at Columbus, O., has designed a wheel-turning lathe that is expected to reduce greatly the expense of turning car wheels. By the use of this device wheels can be turned down in their normal position under the car and while other repair work is in progress.

Two adjustable lathe centers are arranged to slide back and forth on guides permanently built in the shop floor outside of and normal to the main track rails. A tool post, similar in design to that of an ordinary shop lathe, mounted on a pedestal securely bolted to the pit walls and so arranged that it may be raised or lowered to any desired height, is provided for holding the turning tool. The tool is fed by a wheel and screw in the pit. A small motor located in the pit furnishes the power for revolving the car wheels. Connected to the motor is a line shaft and worm gear which in turn connects with a set of transmission and reduction gears. The upper gears are arranged on a movable shaft which may be raised or lowered and thus adjusted to mesh with the teeth of the ordinary gear on the axle of the wheels to be turned. The ratio of the gears is so designed that it is possible to regulate the speed of the wheels to that proper for turning various metals. The flanges of the wheels to be turned can also be accurately shaped by the lathe.


A Lathe for Turning Car Wheels While in Place Under a Car—Side and End Views.

In the use of the lathe the car is run over the pit and is jacked up about one inch or until the lathe centers can be inserted into the axle centers. The lower half of the driving gear case is then removed and the intermediate gear raised from the pit to mesh with the gear of the car axle. The motor is then started and the car wheels are revolved at a proper speed for turning. The lathe tool is next adjusted to the face of the wheel. An emery grinder may be substituted for the tool if the wheel is not in bad condition.

With this lathe it is thought that a large per cent of the troubles from flat wheels can be overcome cheaply, as in using the lathe it will not be necessary to remove the trucks and motors or interfere with the car wiring and motor leads. The device is especially adapted for turning down chilled wheels. When not in use the lathe centers can be moved away from the tracks and the gears and tool posts can be lowered into the pit below the level of the shop floor.

The Jacksonville Electric Company, of Jacksonville, Fla., recently increased the wages of all its conductors and motormen two cents an hour, or from 14, 15 and 16 cents an hour to 16, 17 and 18 cents, according to length of service.

THE WINONA INTERURBAN RAILWAY.

An especially well-built interurban line has recently been completed between Warsaw and Goshen in the northern part of Indiana. This line is the first to be operated of four main divisions which The Winona Interurban Railway Company is planning to include in its system. The other lines under consideration are from Warsaw to Ft. Wayne, Ind., by way of Columbia City, 38 miles; from Warsaw by way of Plymouth to Valparaiso, 61 miles, and a north and south line from Warsaw to Peru, 44 miles. Construction work is well advanced on the latter line and it is expected that cars will be operating between Peru and Chili, 10 miles, within the next few weeks. The grading for the entire 44 miles will be completed within 60 days.

Winona Interurban Railway—Double-Span Pony-Truss Bridge Near Goshen.

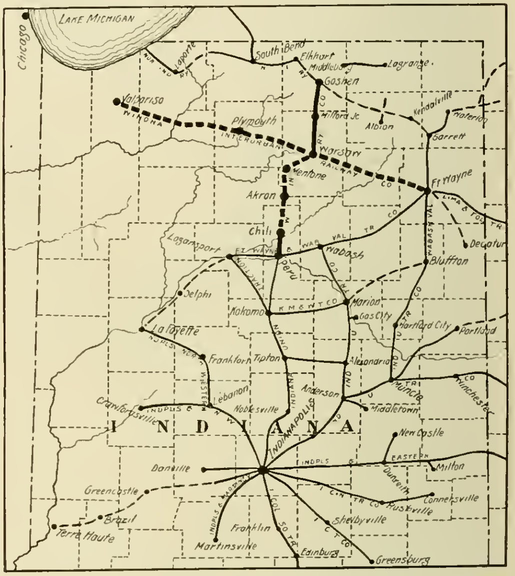
By reference to the map it will be noted that with the completion of these lines several new through routes for electric travel may be established. The line now operating from Warsaw to Goshen connects in the latter-named town with the cars of the Northern Indiana and Southern Michigan railways which operate between Goshen and St. Joseph, Mich., by way of Elkhart and South Bend, Ind. The proposed line from Warsaw to Ft. Wayne connecting with the Ft. Wayne Van Wert & Lima system will give a very direct route to western Ohio. The north and south division from Warsaw to Peru connecting with the Ft. Wayne & Wabash Valley and the Indiana Union Traction lines, will offer a direct route from northern Indiana to Indianapolis.

Winona Interurban Railway—View on Long Tangent near Goshen, Showing Track and Two Pole Lines.

The towns served by The Winona Interurban Railway as now operating have populations as follows: Goshen, 15,000; New Paris, 1,200; Milford, 2,000; Milford Junction, 500; Leesburg, 1,000; Warsaw, 5,000; and Winona Lake, a summer resort, varying from 500 to 7,000. The road has a tributary population of 1,200 people per mile living within a strip 1.5 miles wide on either side of the track between Goshen and Warsaw, but not including the population of these cities.

Track and Roadway.

The topography of the country between Warsaw and Goshen is such that it was possible to build a roadway with very few curves and a light grade. The distance between these two towns by way of the interurban line is 25 miles. For a larger portion of this distance the interurban right of way parallels and is adjacent to the west boundary of the right of way of the Cleveland Cincinnati Chicago & St. Louis (Big 4) steam road. The track of the electric line is built upon a private right of way 50 feet wide. The roadbed was graded with a 16-foot roadway, and sloped 1½ to 1 on embankment and in excavation.



Winona Interurban Railway—Map Showing Line Now Operated and Proposed and Connecting Lines.

With the exception of the Elkhart river, which is bridged by two 96-foot pony-truss steel spans, there were no extensive waterways crossed. The smaller waterways are built of concrete and a sink hole 500 feet wide near Milford Junction is crossed on pile bents. In building this trestle it was necessary to use spliced piling, which were driven 70 feet to a firm foundation in gravel.

The right of way is enclosed with woven wire railroad fence having a barbed wire at the top of the cedar posts which support it. Wing fences and cattle guards are provided at all road crossings.

The track consists of 70-pound A. S. C. E.-section T-rails laid on chestnut ties 6 by 8 inches by 8 feet long spaced 2 feet center to center. Gravel ballast to a depth of 8 inches under the ties supports the track structure. The rail ends are electrically joined by American Steel & Wire Company's bonds. In city streets a No. 0000 10-inch compressed bond is used and on the open track soldered bonds of like capacity are employed. At meeting points double-end side tracks with rigid switches, spring frogs and Buda high-semaphore switch stands are standard.

The 2.5 miles of track between Warsaw and Winona Lake which for some time has been operated with local cars by the Winona Assembly, is built according to late standards for track laid in city streets. In Warsaw and at the Assembly terminus the tracks are arranged in loop form so that single-end cars may be operated. At Goshen a Y is provided for this purpose.

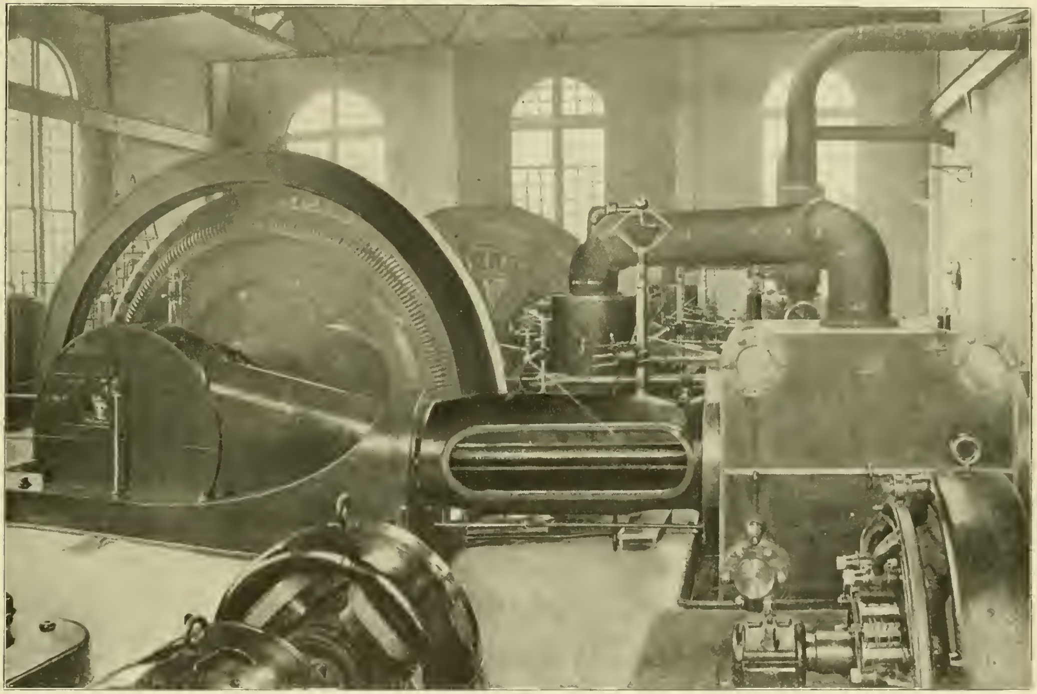
Trolley and Transmission-Line Construction.

There are two separate pole lines, one for the trolley, telephone wires and direct-current feeders, and the other for the high-tension transmission line connecting the two substations with the power house.

The trolley wire, which is No. 000 grooved section, is supported by Richmond flexible brackets bolted to 30-foot chestnut poles spaced 100 feet apart. The butts of the poles were treated with carbolineum. In addition to the trolley bracket each of these poles supports a cross-arm which carries a metallic circuit telephone line comprising two No. 9 Extra BB iron wires on glass insulators, and a 750,000-circular mil stranded-aluminum direct-current feeder tied to the top of butterfly glass insulators. This feeder extends for the entire length of the line. Jack boxes are provided on the poles half a mile apart for connecting the telephone instruments carried in the cars with the telephone line. The overhead material is of the Ohio Brass Company's manufacture. Garton lightning arresters are installed every one-third mile, grounded to iron pipe and also connected with track cross-bonds.

The poles of the high-tension transmission line are set 125 feet apart on the opposite side of the track from those carrying the trolley brackets and direct-current feeders. Thirty-five-foot poles are used with few exceptions throughout the 25 miles of line. Each pole carries a single cross-arm supporting in a horizontal line with 74 and 36-inch spacing, the three No. 4 medium hard-drawn copper wires of the 33-000-volt transmission circuit. By the use of a second cross-arm the wires are transposed at intervals of 10,000 feet. Locke No. 408-B insulators support the wires. The insulators are mounted on malleable iron truss pins bolted through the cross-arms. The high-tension cross-arms are 10 feet long, 3¾x5¾ inches in section, bolted to the poles and supported by a single-piece angle iron braces.

Generating Station.



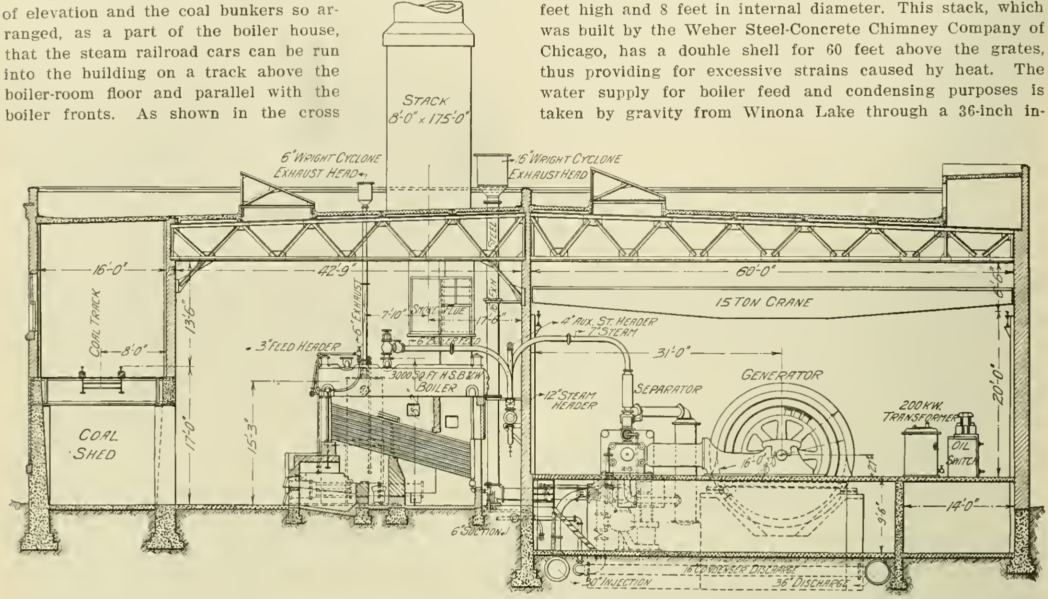
Winona Interurban Railway—Interior of Power Station at Winona Lake Showing Main Units and Exciters.

The power station in which current for operating the entire line is generated, is admirably located close to the north shore of Winona Lake, 2.5 miles east of Warsaw, Ind. The building has brick walls resting on concrete foundations. Brick firewalls separate the main structure into an engine room 96 feet 7 inches by 60 feet, a boiler room 42 feet 9 inches by 84 feet 6 inches, and a coal storage bin 18 feet 2 inches by 84 feet 6 inches. The clear headway in the engine room is 20 feet and in the boiler room 30 feet 6 inches below the lower chords of trusses. The roof, which is of reinforced cinder concrete, is supported on steel trusses. The floors throughout the entire building and all machinery foundations are of concrete. The engine room is spanned by 15-ton Northern crane built for hand operation.

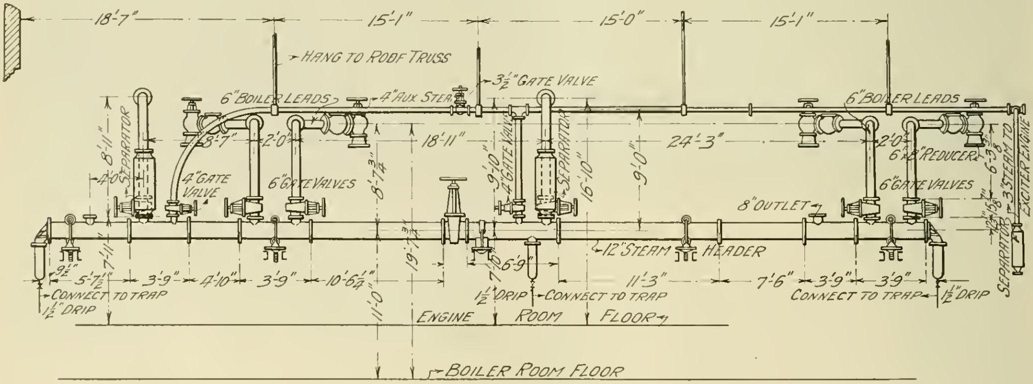
The general design of the entire building and the installation of machinery is such that when the load demands the building may be extended to the west and new units added, still maintaining the general scheme of sectionalizing the apparatus.

Boiler Equipment.

As the boiler-room floor is 17 feet lower than the nearby tracks over which coal is brought to the power house, advantage has been taken of this difference of elevation and the coal bunkers so arranged, as a part of the boiler house, that the steam railroad cars can be run into the building on a track above the boiler-room floor and parallel with the boiler fronts. As shown in the cross section of the building the coal track is supported on steel stringers, which in turn rest upon cross girders set in the outer wall of the building and the concrete paritition wall forming the front of the bunker. This storage bunker extends the entire length of the boiler room, and its interior wall is provided with suitable openings through which steel trucks of one-ton capacity can be wheeled from the bunker to the boiler fronts, where the coal is hand fired.



Winona Interurban Railway—Cross Section of Power House, Winona Lake.



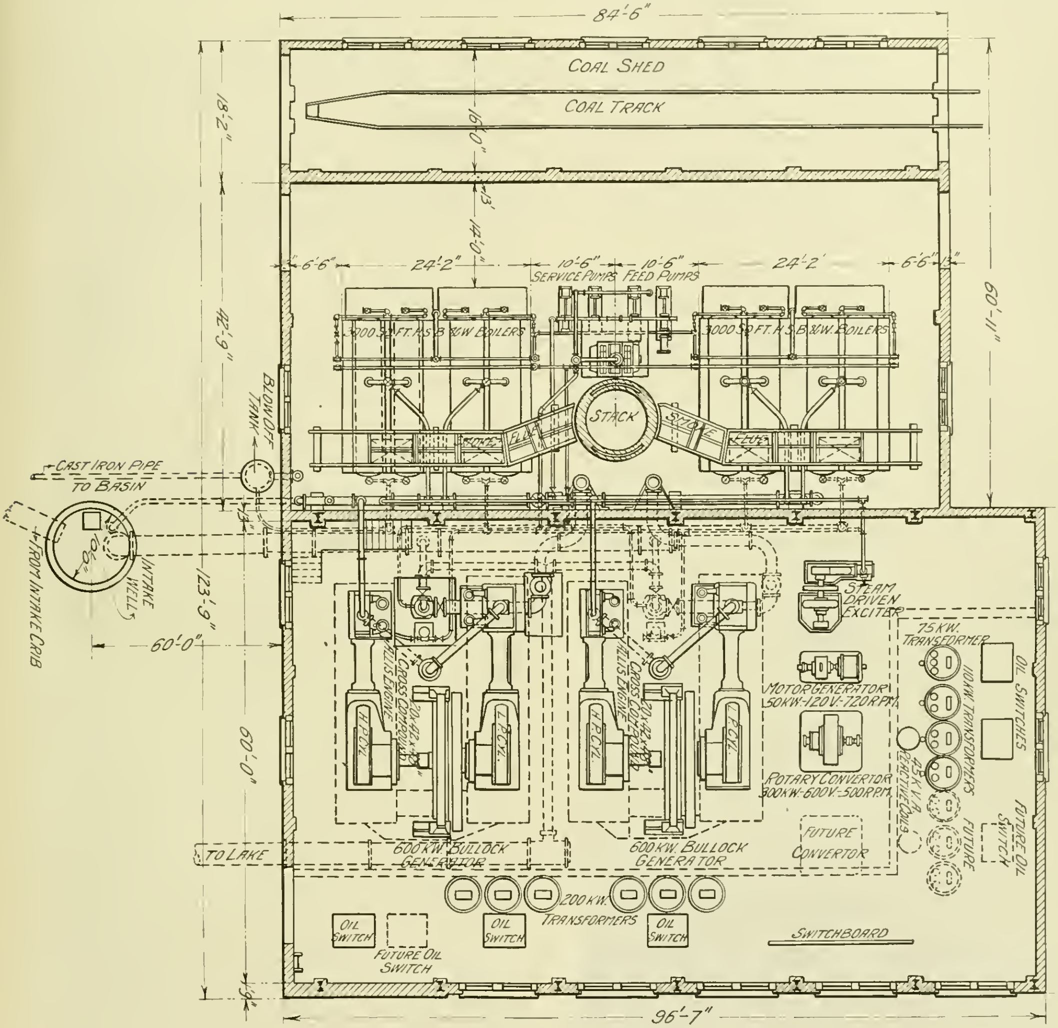
Winona Interurban Railway—Elevation of Steam Header and Connections, Power House.

The boiler equipment consists of four Babcock & Wilcox boilers set in batteries of two each. Each boiler has two 42-inch drums 20 feet 4 inches long and 144 tubes 4 inches in diameter by 18 feet long. The equipment is designed to operate at 150 pounds pressure. There are 3,000 square feet of heating surface provided in each unit. The boilers have brick settings and are provided with extension furnaces and Kelly rocking grates. The combustion gases pass through a steel breeching made of 3-16-inch plates and angles and provided with dampers, to a reinforced concrete stack 175 feet high and 8 feet in internal diameter. This stack, which was built by the Weber Steel-Concrete Chimney Company of Chicago, has a double shell for 60 feet above the grates, thus providing for excessive strains caused by heat. The water supply for boiler feed and condensing purposes is taken by gravity from Winona Lake through a 36-inch injection pipe leading to a supply well 60 feet from the north wall of the boiler house. This pipe from the well to the edge of the lake is of vitrified clay tile. The intake crib, 200 feet from the shore of the lake, is connected with the tile conduit by a pipe 36 inches in diameter made of wooden staves. There are shut-off gates at the crib so that the water may be shut off and the pipe pumped dry for cleaning. The wood pipe is buried in the mud at the bottom of the lake and held in place by piles and cross pieces. The discharge conduit is also 36 inches in diameter and of tile pipe. For a portion of its length this pipe is laid in the same trench with the intake conduit and directly above it. The discharge empties into the lake about 150 feet away from the intake crib.

The supply well, which affords a nearby water reserve for condensing and boiler-feeding purposes, is of concrete 10 feet in diameter and 21 feet deep. Suction for the boiler-feed pumps is taken from the supply well through a 6-inch cast-iron pipe. The lift against which these pumps operate is 10 feet, and a foot valve is placed at the well end of the suction pipe with a steam connection for removing any dirt or anchor ice from the valve. The boiler-feed pumps, which are of the outside center-packed plunger type with cylinders 12 and 8 by 12 inches in size, have their suction connections so piped that water for boiler feeding may be taken either from the well just described or from the feed-water heater. The two low-service pumps, which are of the piston pattern 9 and 8 by 12 inches in size, are connected with a 6-inch suction from the supply well. All the steam piping for these four pumps is covered with Johns-Manville magnesia covering. The pumps are Dean of Indianapolis manufacture and equipped with Fisher governors.

A Cochrane feed-water heater of sufficient capacity for the entire plant is mounted upon a steel framework in front of the stack and 8 feet 6 inches above the feed pumps. All the auxiliaries and the drip system, which includes five Anderson traps on the main header, and the engine separators discharge to this heater. An interesting detail is the practice of piping the discharge from the water-cooled transformers to the feed-water heater, thus adding to the boiler-feed water some of the heat units absorbed by the water in the cooling coils of the main step-up transformers. The heater was placed at an elevation above the suction of the feed pumps with a view to eliminating any possibility of vapors from the water at high temperature passing to the suction and reducing the pump vacuum.

The main steam header is 12 inches in diameter and is mounted on steel brackets supported by columns in the fire



Winona Interurban Railway—Floor Plan of Power House, Winona Lake.

wall between the engine and the boiler rooms. The boiler connections are 6 inches in diameter, and the engine connections 7 inches in diameter. The latter are taken from the top of the main header and pass through the fire wall to connect with Cochrane separators above the engine throttles. Each throttle for the main engine has an auxiliary safety-stop valve, which is set to automatically shut down the engine should the speed exceed the normal by a given percentage. Parallel with and above the main header is a 4-inch auxiliary high-pressure header which supplies steam to the various pumps and auxiliaries.

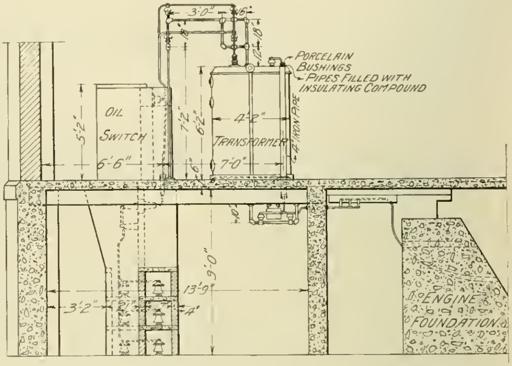
Generating Units.

There are two main generating units consisting of 20 and 42 by 48-inch cross-compound Allis-Chalmers engines designed to run at 94 revolutions per minute with 140 pounds indicated steam pressure and 26 inches of vacuum. The engines are guaranteed to have a steam consumption not to exceed 14.1 pounds per indicated horsepower per hour when delivering 850 horsepower. They are designed for a continuous maximum load of 1,500 horsepower and a momentary maximum load of 1,700 horsepower. Each engine is direct connected to an Allis-Chalmers generator of 600 kilowatts capacity. The generators, which are of the revolving field type, are wound for 25-cycle three-phase alternating current at 2,300 volts pressure.

The engines are provided with a by-pass so that live steam at boiler pressure may be fed to the receiver to facilitate starting when the high pressure is on dead center. The receivers between the high and low-pressure cylinders are drained by Flynn traps. All engine valves are packed with Cook metallic packing and the low-pressure exhaust valves and all piston rods have double steam-sealed metallic packing, the steam being fed from the receiver to the space between the packing rings, thus serving to hold them in place and prevent breaking of the vacuum.

Winona Interurban Railway—Generating Station at Winona Lake, Ind.

Each engine unit has a jet condenser of Dean manufacture, with its auxiliaries located in the basement between the foundations for the high and low-pressure cylinders. Two free-exhaust pipes standing on footings near the stack are provided. Each of the condenser sets has a capacity for 20,000 pounds of exhaust steam per hour with water at 70 degrees F. The condensing water is taken direct from a 30-inch suction main connected with the supply well, as previously described. The discharge is led through two 12-inch pipes into a 16-inch pipe which connects with the 36-inch discharge conduit leading to the lake nearby. The condensers are provided with a forced injection from the low-service pump, for starting. The condenser air pumps can either be operated self-condensing or exhaust to the heater.



Winona Interurban Railway—Details of Generator and Transformer Connections, Power House.

It is the scheme of operation to run condensing during the summer and non-condensing during the cold weather. The utility of this plan of operation is brought about by the nearby demand for steam for heating purposes. The Winona Assembly is now a purchaser of steam, connected to a large amount of radiating surface, for which a rate of 30 cents per square foot per season is paid.

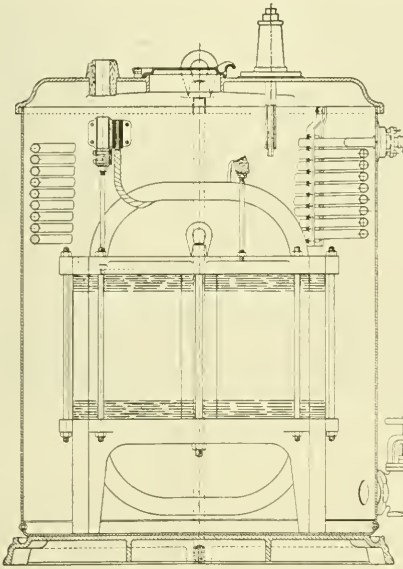
The exciters comprise an Allis-Chalmers 50-kilowatt 6-pole 120-volt generator direct connected to a Ball high-speed engine taking steam from the 4-inch high-pressure auxiliary header, and a 4-pole 50-kilowatt 120-volt Allis-Chalmers generator driven at 720 revolutions per minute by a Bullock 3-phase 25-cycle 375-volt induction motor mounted on the same bedplate. This unit is operated by current taken from the high-tension busbars and stepped down by a separate installation of oil-cooled transformers.

A complete gravity oiling system with a tank in the boiler room above the smoke breeching supplies oil for all the engine bearings. This storage tank is located 30 feet above the engine-room floor and oil from a 300-gallon Turner oil filter is forced to it by a 3 and 2 by 2-inch Fairbanks-Morse steam pump. The oil for the engines passes through a separator before reaching the oil filter, and the overflow from the pressure tank in the boiler room returns to the tank under the filter so that it need not be filtered a second time and thus reduce the capacity of the oiling system.

Like most electric railway plants, the apparatus in this station was put in operation before all the details were completed. When the first generating unit was started it ran for 161 hours before being stopped, since which time it has been in continuous operation from 18 to 20 hours a day. Owing to an unfinished suction line at the time of starting, this unit ran non-condensing for 10 weeks, and then when indicated the cards showed an excellent valve setting.

Current Transforming and Switching Apparatus.

Each of the 2,300-volt 600-kilowatt main generators feeds direct through insulated cables to three 200-kilowatt capacity oil and water-cooled transformers, which step up the pressure from that of the generators, 2,300 volts, to the distribution pressure of 33,000 volts. As shown in one of the illustrations, the 2,300-volt leads from the generators pass under the engine-room floor and through the basement wall which separates the high-tension busbar compartment from the larger part of the basement. Wherever such cables pass through brick or concrete work they are enclosed in bituminized fiber conduit. The step-up transformers just mentioned and the high-tension oil switches stand on the engine-room floor directly over the busbar compartment. The delta connections for the 2,300-volt machine leads are made on the angle-iron rack supported from the basement ceiling. The leads to the transformers from the cables on this rack are carried through the engine-room floor and to an elevation even with the top of the transformers through metal pipes supported by floor sockets.


Winona Interurban Railway—Sectional View of Oil and Water-Cooled Transformer.

The 33,000-volt leads from the step-up transformers connect with the terminals of Westinghouse type-C oil switches. These high-tension wires are insulated and supported on a pipe rack, as shown in one of the illustrations. A double-throw pilot switch on the control board makes the action of the oil switches at will either automatic or non-automatic. The series and potential transformers for the instruments on the switchboard are mounted on an angle-iron rack in the busbar compartment room.

From the machine oil-switches the 33,000-volt leads pass directly down to the horizontal bus-wire compartments extending the length of the building. These compartments, a sectional view of which is shown in one of the illustrations, have their side walls made of red repressed brick laid in Portland cement mortar. The horizontal barriers are of pneumatically-tamped concrete slabs which were very carefully made so as to render them moisture proof. The three high-tension bus-wires consist of No. 1 hard-drawn copper mounted on Locke 60,000-volt porcelain-lined insulators in their septums, which are 17 inches square in section. The line connections from the high-potential buses are taken off at one end of the compartments and pass directly up from the buses to 33,000-volt oil switches remotely controlled from the switchboard and of a similar type to the machine switches. From the oil switches the outgoing high-potential feeders pass as insulated wires to bituminized fiber conduit built in the outside wall of the engine room. These conduits extend to the lightning-arrester gallery, which is above the general roof level and constructed of reinforced concrete. The design and interior arrangement of this house is similar to that of the wire tower on a substation, an illustration of which is presented. The outgoing transmission lines are carried through the wall of the lightning-arrester house in bituminized fiber wall tubes and thence to standard line insulators on a cross-arm outside.

It will be noted that the arrangement of the high-tension conductors in the busbar compartment follows out the general engineering scheme of arranging all the apparatus from the boilers to the outgoing high-potential feeders in units which are only cross-connected by equalizers that may, in emergency, be disconnected and leave any one section of the building in fully operative condition.

The switchboard for controlling the generating and transforming apparatus consists of a number of marble panels held together by angle-irons and set upon a timber through which all leads pass to the busbar compartment in the basement. The switchboard includes the following sections:

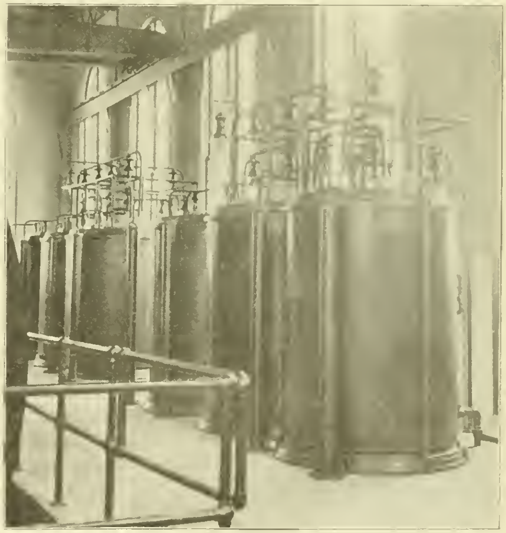
Two direct-current exciter panels, one for the steam-driven unit and one for the motor-driven unit. Each of these panels is provided with a voltmeter, an ammeter and main and auxiliary switches, the latter being used for the station lighting service.

One alternating-current panel for the motor of the motor-driven exciter with a time-limit relay, integrating wattmeter and a main oil switch.

Two generator panels, each having a voltmeter, ammeter, integrating and indicating wattmeters, field switch, control switch for main oil switch, a pilot switch by the use of which, as earlier stated, the main oil switch may be made to act either automatic or non-automatic; synchronizing receptacles with connection such that unless the synchronizing plug is in the proper receptacle and therefore the synchroscope properly connected the oil switch cannot be closed; synchroscope, double-pole double-throw switch to control engine governor for synchronizing with spring protecting plugs so that this switch cannot be left closed; double-pole double-throw switch for connecting indicating wattmeter to read either wattless or power current.

Two control panels for outgoing high-tension lines each with three ammeters and oil-switch handles.

Two alternating-current panels for controlling the high-potential oil switches feeding current to the power house rotary-converter substation.


Winona Interurban Railway—Oil and Water-Cooled Transformers in Main Station with 33.000-Volt Wiring on Pipe Rack.

Two direct-current rotary panels.
Two direct-current feeder panels.
Bracket voltmeter.

In this switchboard all the alternating-current instruments are of Westinghouse make and those for direct current are of the Weston make. The pilot current for the remote-control switches is taken from the exciter busbars. The direct-current circuit breakers are provided with bell alarms.

Winona Interurban Railway—Exterior of Substation at Goshen.

The lighting of the building is effected by arc lights for general illumination and incandescent lamps for local use. Current for the lighting circuits is taken from the exciter busbars through wires placed in conduit leading to local panels mounted in iron boxes about the building.

Substation in Power House.

Six-hundred-volt direct current for feeding the trolley line near Winona Lake and Warsaw is obtained from a rotary-converter substation in the main power house. The apparatus of this substation is so placed that when the proposed addition to the main power plant with its two generating units has been completed, the substation will then occupy the center of the entire engine room.

The substation contains two 300-kilowatt Allis-Chalmers rotaries supported on steel floor beams over openings to the basement through which the cables are led. The alternating current for supplying the rotary is stepped down from the transmission pressure of 33,000 volts to 375 volts by three 110-kilowatt oil-cooled transformers standing on the engine-room floor. These transformers are supplied with high-tension current from an extension of the main busbar compartment, as earlier described. Half-voltage taps are provided for starting the rotary from the alternating-current end.

Line Substations.

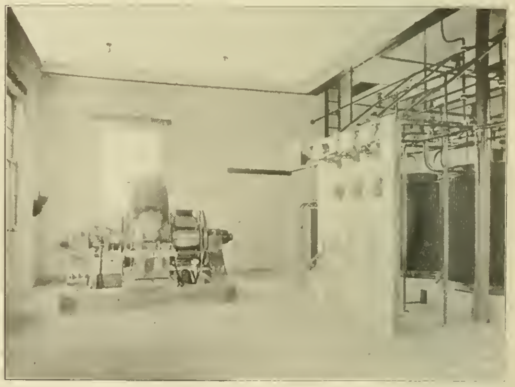
There are two rotary-converter substations on the line outside of the power house. These two stations are of substantial fireproof construction, located one at Goshen and one near Milford. The arrangement of the converting apparatus and switching connections is shown in one of the accompanying illustrations. The apparatus in each substation includes a 600-volt 300-kilowatt Bullock rotary converter taking current through a reactive coil from three 110-kilowatt single-phase Allis-Chalmers oil-cooled transformers. The floor space of the substation buildings is so arranged that the equipment of each station may be doubled when necessary.

The incoming high-tension wires carrying the 33,000-volt current from the power house are taken into the wire tower through bituminized fiber wall insulators. In this tower are the lightning arresters and disconnecting switches. The high-potential wires then pass down the rear wall of the substation on standard line insulators, connecting midway with the instrument transformers. At an elevation about 8 feet above the floor is a structure of pipe which supports the insulated high-potential bus-wires. Through the medium of an oil switch these wires are connected with the primary side of the three 110-kilowatt single-phase transformers. The low-tension transformer connections are carried to the reactance coil and the rotary as 750,000-circular mil cables. A six-panel marble switchboard fitted with instruments similar to those for the power-house substation serves for controlling the equipment.

Rolling Stock.

The rolling stock equipment for the new line includes 4 combination passenger and baggage cars, which are among the largest ever built for interurban service. The accompanying floor plan will serve to show the general dimensions and interior arrangement of a standard car. It will be noted that the length over all is 57 feet 8 inches and width over all is 9 feet 4 inches. The height of the car body from the under side of the sill to the top of the roof sheathing is 9 feet 8 inches. The bottom framing is unusually strong. The side sills consist of 7-inch I-beams reinforced with long-leaf yellow-pine sills, bolted on either side. The center sills consist of 6-inch I-beams similarly reinforced, and the intermediate sills are of pine. The center and intermediate sills run from buffer to buffer, and the framing is supported on the trucks by bolsters of the steam-coach type. The framing of the body of the car is of white ash, designed similar to steam railroad practice. There are two floors; the under floor of maple supports a filler 1½ inches deep of mineral wool, on top of which is the upper floor of long-leaf yellow pine.

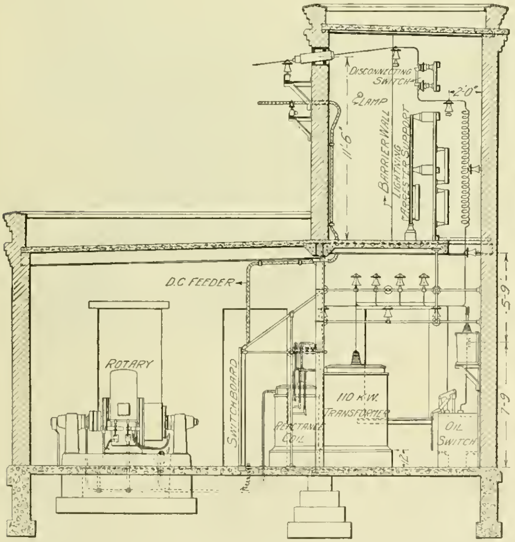
It will be noted from the floor plan that the body of the car is divided into three compartments; the main compartment is in the rear; ahead of this is the smoking compartment, and the baggage room is in front containing the Peter Smith hot-water heater. The doors to the various compartments are hung on hinges, by which practice it is thought to eliminate rattling, prevent draughts and facilitate passage to and from the various compartments.



Winona Interurban Railway—Interior of Substation at Goshen.

Winona Interurban Railway—Interior of Passenger Compartment, Standard Car.

The interior of the smoking compartments is finished with inlaid mahogany and the ceiling is of the full empire type painted green with gold decorations. The seats in both these compartments are of the "walkover" type with high roll-top backs. They are upholstered in green plush in the main compartment and horsehide in the smoking compartment. It is interesting to note that the generous dimensions of this car permit of seats with arm rests, the total over-all dimension of which seats is 40 inches.



Winona Interurban Railway—Sectional Elevation of Rotary Converter Substation.

Polished plate glass is used except in the Gothics and deck lights, which are of hard metal art glass. Each window opening is arranged for a removable storm sash. All the fittings of the car are of solid bronze and the curtains are of pantasote. The lighting arrangements have been carefully planned and comprise a row of frosted globes along the deck sill and Meridian lamps with holophane reflectors along the center of the ceiling. The entire floor of the car, except in the baggage compartment, is covered with inlaid linoleum, and the inside of the toilet room is lined with white enameled zinc. The toilet fixtures are of the latest Pullman type of Duner manufacture. The exterior of the car is painted Pullman green.

The car bodies are mounted on Baldwin M. C. B. trucks having axles 5½ inches in diameter at the center and 6½ inches in diameter at the gear and wheel seats. Symington journal boxes are used and the journals are 4¼ by 8 inches in size. The steel wheels are 36 inches in diameter with cast-iron centers. The steel tire is 3 inches thick with 3½-inch tread and a flange 1⅜ inches wide by 1⅛ inches deep. The electrical equipment consists of four 75-horsepower Allis-Chalmers-Bullock direct-current motors with series-parallel control. All car wiring is carried in iron conduits fastened to the under side of the car floor. Christensen B-2 airbrake equipments are used.

Other of the car fittings include De France air sanders, Aikman pressure regulators and Stromberg-Carlson telephone sets carried in the motorman's vestibules.

Schedules.

The regular service includes a car run in each direction every hour. The running time for the 25 miles is one hour, but the physical conditions are such that when desired the running time may be shortened. A fare of 2 cents a mile is charged with 150 pounds of baggage carried free. For excess baggage, 20 per cent of the regular fare is charged per 100 pounds, with a minimum charge of 25 cents. There are ticket offices and agents at each town. The first car from Warsaw north each morning at 5:45 o'clock is known as the paper car and distributes Chicago papers for all the towns along the line, including Goshen.

The local service over the 2½-mile line between Warsaw and Winona Lake includes cars on 7½ and 15-minute headways in the summer and on 30-minute headway during the winter.

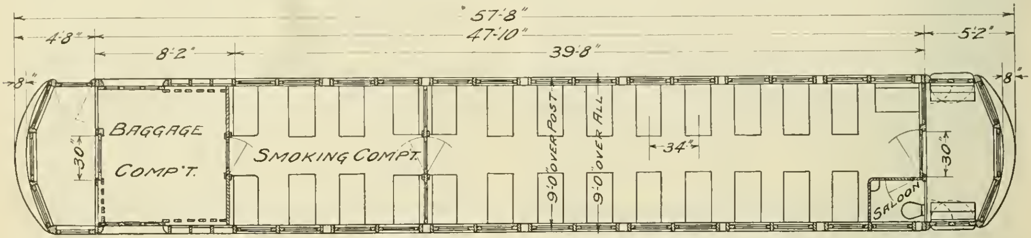
Winona Interurban Railway—View in Boiler Room Showing Extension Furnaces, Heater and Pumps.

A local light freight and express business is now handled on all cars, the rates being the same as those charged by the parallel steam road and the express company operating over it. The interurban line will soon have available two large freight cars equipped with motors, by the use of which it can offer a very satisfactory service. The company has interchange agreements with all intersecting steam roads and has the following steam railroad track connections: At Milford Junction with the Baltimore & Ohio; at Warsaw, Goshen and Milford Junction, with the Cleveland Cincinnati Chicago & St. Louis Railroad; at Warsaw and

Winona Lake, with the Pennsylvania Railroad; and at New Paris, with the Wabash Railroad.

Ownership and Organization.

The new line as described is owned by the Winona Assembly and Summer School. The total stock issue of $15,000 is held in trust by the 15 directors of the assembly and the profits from operation go to the schools which are owned and managed by the assembly. As the Winona Electric Light & Water Company, which owns the electric lighting and water supply plants in both Winona and Warsaw, is also owned by the Winona Assembly and Summer School, the various properties can be economically supervised by one set of operating officials. The following are the officers of the Winona Interurban Railway Company: H. J. Heinz, president, Pittsburg, Pa.; J. F. Beyer, vice-president, Warsaw, Ind.; S. C. Dickey, secretary and general manager, Winona Lake, Ind.; William M. Camp, treasurer, Bement, Ill.; August Gilmore, auditor; H. S. Dickey, general superintendent; R. M. Murray, chief engineer; and Charles Sigler, electrical engineer and master mechanic, Winona Lake, Ind.



Winona Interurban Railway—Floor Plan of Standard Passenger Car.

Electrical Installation Company, of Chicago, was contractor for the entire road, with the exception of the grading and ballasting, which work was done by the owner. Allis-Chalmers Company, of Milwaukee, supplied all the machinery and electrical equipment in the power house, substations and cars.

Winona Interurban Railway—Standard Passenger and Baggage Car 57 Feet 8 Inches Long.

In the design and construction of the road Sargent & Lundy, of Chicago, represented The Winona Interurban Railway as consulting engineer. This firm also designed and superintended the erection of the power station and substations and furnished the design for the pole line and subgrade.

The Municipal Traction Company, of Cleveland, which recently began operating the first section of its three-cent fare line, is using a circular aluminum fare-check with a hole in the center. The ticket is about the size of a nickel, the hole doubtless representing the two cents saved.

AN OPEN-AIR HIGH-TENSION SWITCH.

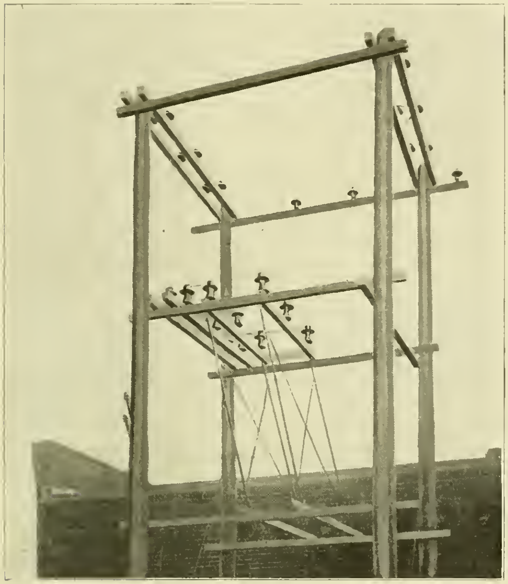
The new type of open-air high-tension switch shown in the illustration has been in use for several months on the 13,500-volt transmission lines of the Fort Wayne & Wabash Valley Traction Company which operates out of Fort Wayne, Ind. The switch was designed and installed by Mr. M. J. Kehoe, engineer of that company. The parts were manufactured for Mr. Kehoe by the Ohio Brass Company. The essential parts of the device are the three fixed bell-mouths to which one side of line is attached, supported on a framework consisting of four poles and cross braces, and a swinging frame on long arms which carries the other terminals of the lines. These contact pieces are well-insulated brass rods so placed that when the frame carrying them is swung forward the ends of the rods enter the fixed bell-mouths and close the circuits.

The new switch is not intended as a substitute for oil-break or other types of switches as usually installed in substations, but was designed particularly for installation at exposed points along high-tension lines where another type of switch would require an expensive shelter. It frequently happens that two or more high-tension lines after running parallel for several miles diverge at a junction point. When repairs are to be made on one of these lines at points beyond the junction, it is usually necessary to have the power house switchboard attendant cut off all current from the lines, thus preventing any injury to workmen through inductive effects. Under such conditions the installation of open-air-break switches at junction points makes it necessary to cut out only that line on which repairs are being made and this switching can be done by the line repairmen.

Contrary to what would be expected with a normal load, the three arcs are not more than 6 inches long when opening a circuit under 13,500 volts pressure. These arcs are insufficient to produce blistering of the terminals as has been proven by operating the switch repeatedly under a load of 600 kilowatts. That the arc is small is largely due to the fact that the inertia of the rotary converters on one side of the line keeps the voltage well up to that of the generating machines during the period that the circuit is being broken.

The insulation of the line is maintained at the switch, the conductors being carried through it on standard high-tension insulators.

The small expense of installing switches of this type makes it possible to place them at frequent intervals along high-tension lines, so that should a pole be found burning or other similar trouble be located on the line the current can be cut off at the nearest switch and the trouble remedied without delay. When so installed the switches may be operated by the linemen working on the line and the danger of misunderstandings at the power house as to whether or not the switches are on or off can be avoided.



General View of Open-Air High-Tension Line Switch.

Successful Operation of Trains in the Simplon Tunnel.

In view of certain misleading reports which have been circulated on the subject, it may be of interest to know that the electrification of the lines through the Simplon Tunnel is now complete. Since August 1 the Brown-Boveri electric locomotives have drawn 15 trains daily through the tunnel. The only steam-operated trains are the through trains de luxe (which run three times a week), and, in addition to these, one other engine passes daily through the tunnel from the locomotive sheds at Brigue for service between Iselle and Domo Dossola. As was only to be expected, some technical difficulties were met with at first. Considerable deposits of soot had accumulated on the insulators of the overhead conductors, and these had to be very thoroughly cleaned during the intervals between working. Further, owing to the unusually damp condition of the atmosphere in which the motors have to work, it has been found advisable to completely enclose them and to depend entirely on internal ventilation, no air whatever being allowed to enter from the outside. The electric locomotives have now been running regularly since August 1, and the whole system is working most satisfactorily. In addition to the 1,000 horsepower locomotives already supplied, Messrs. Brown, Boveri & Co. have two similar locomotives in hand for the further requirements of this service.—The Electrician, London.

RECONSTRUCTION OF THE OLIVE STREET TRACK, UNITED RAILWAYS COMPANY OF ST. LOUIS.*

BY RICHARD M'CULLOCH.

The first street railway track laid in the city of St. Louis was that laid on Olive street from Fourth street to Fourteenth street. The original rail was a flat strap rail, and the road was opened for traffic as a horse-car line on the Fourth of July, 1859. In 1887 the Olive street line was converted into a cable line, a double cable track being built from Fourth street to Boyle avenue, a distance of 3.5 miles. The original rail having worn out, in 1898 the rail of the cable road was renewed. An extra heavy section of 4½-inch rail weighing 67 pounds per yard was used. In 1901 the road was converted into an electric road, electric cars being operated over the cable roadbed without change.

This rail, however, was entirely too light for service under heavy electric cars. In 1903, the year before the World's Fair, about one-half of the track was relaid with a 9-inch rail for the outside rail and a 6⅝-inch rail for the inside rail.

In the spring of 1906, when it was necessary to relay the old cable track on account of the rail being worn out, that portion of the track reconstructed in 1903 was in such a bad condition that it was considered best to relay both of the tracks and put the street into first-class shape.

In order to understand the need for speed in the construction, it should be stated that the Olive street line is the one having the heaviest traffic in the United Railways system. During the middle of the day the cars are 1.5 minutes apart, and night and morning during the hours of heaviest travel the headway between cars is reduced to 50 seconds. Olive street throughout its entire length is a narrow street, only 36 feet wide between curbs, and lined with retail stores. As a concrete construction for the track was decided upon, it was necessary to remove the cars from each track during its construction. The street being entirely too narrow for a third temporary track, it was necessary to route the cars over another parallel line. In order to make these changes in routing, a temporary track was laid in Boyle avenue from Maryland avenue to Laclede avenue, a distance of about 1,500 feet. This temporary track was laid with 75-pound T-rail spiked to wooden ties, the ties being placed on top of the brick pavement of the street. In passing, it is interesting to note that when this temporary track was removed after cars had been running over it for six weeks, absolutely no damage whatever had been done to the brick pavement.

For the new track there was adopted a girder Trilby rail, 9 inches high, laid on cypress ties spaced 2 feet between centers. Brace tie plates and Goldie claw tie plates were used on alternate ties. Tie rods, 2 by ⅜ inches in section, were spaced 6 feet apart. Six inches of Portland cement concrete was placed beneath the ties, and the concrete was carried up high enough on the rail to support the style of paving adopted, making a thickness of 14 inches of concrete in the case of granite paving and 18 inches for asphalt paving. In either case the wooden tie was entirely embedded in the concrete. For the first portion of the reconstruction the work was divided into three sections. Each of these sections is about a mile of double track. Three separate foremen with independent gangs were put in charge, each foreman in charge of a section. Work was carried on day and night.

Excavation.

In order to build the track, it was necessary to make an excavation 21 inches in depth in a concrete which had been setting for 18 years, and which experience in whatever excavations had been made had shown to be extremely hard. If it had been necessary to pick out six miles of this concrete by hand the cost would have been excessive, and, disregarding the cost, the time involved and the number of men required would have been prohibitory of that method.

Drilling and Blasting.

The method adopted for excavating the concrete was by blasting with small charges of dynamite, the object being to make these charges strong enough to shatter the concrete so that it could be taken out in large pieces, but not heavy enough to do other damage. Holes were drilled 7 to 8 inches deep in the concrete, four holes between each pair of yokes. The hole was located so that the bottom of the hole was a little below the center of gravity of the section of concrete to be removed. For drilling the holes there were used No. 2 "Little Jap" drills made by the Ingersoll-Rand Company, operated by compressed air at 90 pounds pressure. This tool drills a 1.25-inch hole. A dry hole is drilled, the exhaust air from the hollow drill steel blowing the dust from the hole and keeping it clean. Common labor was used to run the drills and very little mechanical trouble was experienced. Three cars were fitted up, one for each gang, each car being equipped with a motor-driven air compressor, water for cooling the compressors being obtained from the fire plugs along the route. The air compressors were taken temporarily from those in use in the repair shops, no special machines being bought for the purpose. Current for operating the air compressor motors was taken from the trolley wire over the tracks. The car was moved along as the holes were drilled, air being conveyed from the car to the drills through a flexible hose. Two drills were operated normally from each car. One of the air compressors was exceptionally large and at times operated four drills. The total number of holes drilled in the reconstruction of the track was 31,000. The total feet of hole drilled was 20,700 feet. The following figures give the average performance of the best one of the drilling outfits, which operated from two to three drills:

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*Abstract of paper read before the Engineers' Club of St. Louis, September 19, 1906.

Depth of hole	8 in.
Number of holes per hour per drill	30
Feet of hole drilled per hour per drill	20.3
Labor cost per foot of hole drilled	$0.027
Labor cost of drilling per cubic yard, blasted	$0.085
Drilling cost per lineal foot of track	$0.017
Drilling cost per mile of track	$89.76

In these figures there is no charge for electric power or for depreciation of machinery.

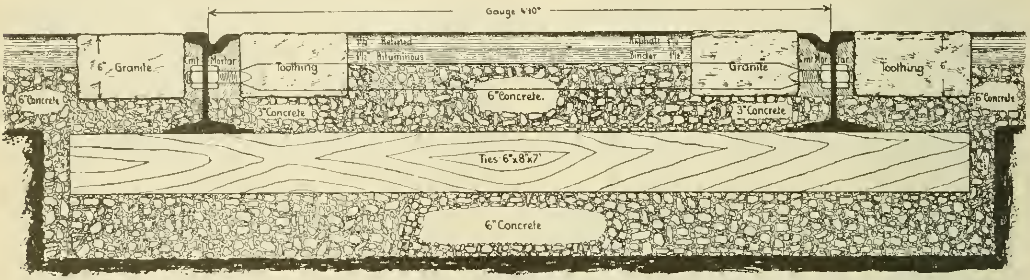
For blasting, a 0.1-pound charge of 40 per cent dynamite was used in each hole. A fulminating cap was used to explode the charge, and 12 holes were shot at one time by an electric firing machine. In order to prevent any damage being done by flying rocks at the time of the explosion, each blasting gang was supplied with a cover car, which was merely a flat car with a heavy bottom and side boards. When a charge was to be fired, this car was run over the 12 holes and the side boards let down, so that the charge was entirely covered. This work was remarkably free from accidents. There were no personal accident claims whatever, and the total amount paid out for property damages for the whole six miles of construction was $685. Most of this was for glass broken by the shock of explosion. There was no glass broken by flying particles.

For the drilling and blasting the old rail had been left in place to carry the air compressor car and the cover car. After the blasting, this rail was removed and the concrete excavated to the required depth. In most cases the cable yokes had been broken by the force of the blast. Where these yokes had not been broken, they were knocked out by blows from pieces of rail. The efficacy of the blasting depended largely upon the proper location of the hole. Where the holes had been drilled close to the middle of the concrete block, so that the dynamite charge was exploded a little below the center of gravity of the section, the concrete was well shattered and could be picked out in large pieces. Where the hole had been located too close to either side of the concrete block, however, the charge would blow out at one side and a large mass of solid concrete would be left intact on the other side. The total estimated quantity of concrete blasted was 6,558 cubic yards or 0.2 cubic yards of concrete per lineal foot of track. The cost of the dynamite delivered in 0.1-pound packages was 13 cents per pound. The exploders cost $0.0255 each.

The following statistics represent the average work of the three gangs working on the west-bound track between Fourteenth street and Boyle avenue:

Cost of dynamite charge per hole	$ 0.013
Cost of exploder per hole	$0.0255
Four holes blasted in each four feet of track:	
Lineal feet of track blasted per hour	138
Cubic yards of concrete blasted per hour	27.6
Cubic yards of concrete blasted per pound of dynamite	2
Labor cost per cubic yard, blasted	$0.076
Cost of dynamite and exploders per cubic yard, blasted	$0.192
Cost of labor and material per cubic yard, blasted	$0.268
Cost of blasting per lineal foot of track	$0.054
Cost of blasting per mile of track	$285.12
Cost of drilling and blasting per cubic yard	$0.353
Cost of drilling and blasting per lineal foot of track	$0.071
Cost of drilling and blasting per mile of track	$374.88

When the excavation was completed, the ties were placed in the trench, the rail spiked down, the tie rods pulled up to gauge and temporary fishplates put on the joints. Work trains were then run on this track and the excavated materials hauled away. The excavated material in this job amounted to 11,410 cubic yards, or 0.348 cubic yards per lineal foot of track. The United Railways Company purchased a sink hole on North Grand avenue and completely filled it with excavated material from Olive street. All excavated material and all new material with the exception of the cement used in this work was handled on cars, no teams being used at all. It would have been impossible to do the work in the time occupied had wagons and teams been depended upon.



Reconstruction of Olive Street Tracks—Cross-Section of Tracks in Asphalt Pavement.

Rail.

The rail used in this work was Lorain section 333, furnished in lengths of 60 feet. The standard section has 7-16-inch web, but it was considered desirable to have it rolled with ½-inch web, and the rail with this change weighs 112 pounds per yard. Its height is 9 inches, and the base is 5½ inches. The head is what is known as the Trilby type, having a groove for the wheel flange and a turned-over lip for the street traffic. It is a very desirable rail head for street traffic, as vehicles can cross it without bumping, but any rail with a wagon tread has an extremely limited life. The depth of groove in the rail is 1⅛ inches. The flange of the car wheel is ⅝ inch deep. Therefore, whenever ½ inch is worn off the head of the rail, the wheel is running on its flange and the rail is worn out for railway purposes, although it may be in perfect condition otherwise. This merely demonstrates the advantage of the T-rail, the use of which is unfortunately prohibited by our city ordinances.

Ties.

The ties were of hewn cypress, 6 by 8 inches in section and 7 feet long. The ties were spaced two feet between centers. Tie plates were used under the rail, each alternate tie plate being a brace plate.

Concreting.

After the excavated material had been hauled away and the street cleaned up, the track was lined and surfaced by means of wooden blocks and wedges placed beneath the ties. Concrete was then tamped beneath and around the ties, the concrete being deposited in the track from a concrete mixing machine running on the rails. The concrete used was composed of a mixture by volume of one part of Portland cement, 2½ parts of river sand and 6½ parts of crushed limestone rock. The cost (delivered) of the materials composing this concrete was as follows:

Crushed rock..2.85 per square = $0.0285 per cu. ft. = 0.77 per cu. yd.
Sand........$2.50 per square = $0 025 per cu. ft. = 0.675 per cu. yd.
Portland cement................$1.70 per barrel = $0.425 per sack.

For the track work, 7.36 cubic feet, or 0.273 cubic yards, were required per lineal foot of track; 1¼ sacks of cement per lineal foot of track, or 1,650 barrels of cement per mile of track, were used in this work.

The value of the materials used (cement, rock, and sand) was $0.108 per cubic foot of concrete, or $2.92 per cubic yard of concrete.

The material for the concrete was distributed on the street beside the tracks in advance of the machine, the sand being first deposited, then the crushed rock piled on that. and finally the cement sacks emptied on top of this pile. The materials were shoveled from this pile into the concrete mixing machine without any attempt at hand mixing on the street. Great care was taken in the delivery of materials on the street to have exactly the proper quantity of sand, rock and cement, so that there would be enough for the ballasting of the track to the proper height and that none would be left over. Each car was marked with its capacity in cubic feet, and each receiver was furnished with a table by which he could easily estimate the number of lineal feet of track over which the load should be distributed.

Concrete Mixing Machines.

The concrete mixing machines were designed and built in the shops of the United Railways Company. Three machines were used in this work, one for each gang. The following figures give the average performance of the three machines in concreting the westbound track from Fourteenth street to Boyle avenue:

Number of men employed at machine	27
Number of men shoveling into machine	14
Lineal feet of track concreted per hour	80.95
Cubic feet of concrete discharged per hour	595.79
Cubic yards of concrete discharged per hour	22.06
Labor cost of concrete per lineal foot of track	$0.071
Labor cost of concrete per cubic yard	$0.26
Cost of materials composing concrete per lineal foot of track	$0.791
Cost of materials composing concrete per cubic yard	$2.92
Total cost of concrete (labor and material) per lineal foot of track	$0.862
Total cost of concrete (labor and material) per cubic yard	$3.18
Total cost of concrete (labor and material) per mile of single track	$4,551.36

In these figures there is no charge for electric power or for depreciation.

Joints.

The rail joint adopted for this work was the cast-welded joint. This joint has been in use since 1896, the first use of it having been in this city. The secret of success with this process of joining rails consists in thoroughly cleaning the rail ends, removing every particle of oxide, and in having the iron intensely hot when poured. Where these two precautions are taken, an actual welding takes place between the cast iron and the steel, a joint sawed in two showing an eating away of the base of the rail where the melted cast iron has struck it. Good joints have an electrical conductivity equal to, if not greater than, the same length of rail.

The cast-iron joints used on the 9-inch rail, weigh 170 pounds, and the cross-sectional area is 65 square inches. Assuming a tensile strength of 15,000 pounds per square inch for cast iron, the tensile strength of the joint is 975,000 pounds, which indicates that the joint is stronger than the rail.

Paving.

The last process in the track construction was the paving. Olive street east of Grand avenue is a granite street, and the track was paved with granite blocks resting on a sand cushion 1 inch deep. West of Grand avenue the street was asphalt, and the tracks were paved with 3 inches of asphalt laid on the concrete, the asphalt being finished up against granite blocks set next the rails. This construction makes a smooth and sightly pavement. In all cases both sides of the rail were plastered underneath the head with a cement mortar, so that the paving blocks rested against a vertical surface and were prevented from sliding under the head of the rail. A cross-section of the finished track is shown.

After the concrete work was finished, the concrete was allowed seven days to set before cars were allowed to run over it. This interval sufficed for the paving, so that the track was entirely finished before it was opened for traffic.

Speed of Construction.

The United Railways Company officials are especially proud of the speed with which this difficult work was performed. For the section between Fourteenth street and Boyle avenue (5.51 miles), work was begun on April 30, 1906, and the cars were turned back on the street on June 11, 1906, exactly six weeks having elapsed since ground was broken. Of this time, two weeks were allowed for the setting of the concrete, so that the entire work, with exception of the paving, was done in four weeks, which is an average of 1,040 lineal feet of single track (0.20 miles) per day. The cost of this 5½ miles of track was about $170,500. For the entire work, after making the credits for scrap material from the old track, the average cost per mile of completed track was about $27,000. The wear on a track is directly proportional to the number of cars run over it. As has already been stated, the type of rail used in this construction is worn out for railway purposes when the wheel flange runs on the rail, which will occur when about ¾ inch is worn off the head of the rail. It is hoped that with the rail supported so firmly as in this case, so that there is no deflection as the car wheel passes over it, the rail wear will be minimized, but with the heavy traffic of this street, it is doubtful if the rail will have a life of more than 10 years. The roadbed itself, however, should outlast several sets of rails. The ties are entirely embedded in concrete and are not subject to decay, and it is proposed that when the present rails are worn out, new rails shall be put down on the same roadbed, making the matter of renewing the rails a comparatively inexpensive process.

POWER GASES AND THEIR PRODUCTION.

During the discussion of the interesting paper on "Gas Engines" read by Mr. Paul Winsor before the American Street and Interurban Railway Engineering Association on October 16, and presented in the Daily Electric Railway Review of October 17, page 750, the author, as requested, described in detail the several kinds of power gases. In view of the present widespread interest in this subject we are pleased to present these instructive data:

Description of Gases.

Natural gas, which has a very high heat value and consists almost entirely of hydro-carbon gases.

Coal gas, with a heat value of about half that of natural gas, made from the distillation of coal in a closed retort and consisting of hydro-carbons with a considerable portion of free hydrogen.

Water gas, with a heat value of about one-third that of coal gas and consisting very largely of hydrogen.

Producer gas, of about one-sixth the heat value of coal gas and consisting of carbon monoxide largely diluted with nitrogen from the air.

Blast furnace gas, which is even lower in heat value than producer gas and of the same general nature.

Characteristics of Power Gases.

Percentage	H	CO	CH_4	CO_2	N	B.T.U. per Cu.Ft.
Natural gas	1.7	0.55	94.16	0.29	2.80	888
Common-coal gas	39.78	7.04	45.16	1.08	0.50	651
Uncarburetted water gas	49.50	35.93	1.05	4.25	8.75	265
Producer gas	18.0	25.0	3.0	7.0	47.0	115
Loomis-Pettibone coal gas	16.	26.00	1.2	4.00	52.8	120
Blast furnace gas	3.0	27.5		10.0	59.4	99

Explanation of Table.

H—Hydrogen.

A combustible gas. Heat value 344 B. t. u. per cubic foot. Formed by the dis-association of water. It ignites at a comparatively low temperature and when used in quantity in a gas engine will often ignite prematurely from hot particles in the cylinder, or even from the hot metal of the cylinder.

CO—Carbon Monoxide.

A combustible gas. Heat value 342 B. t. u. per cubic foot. Formed from the imperfect combustion of carbon. The ideal gas for gas engine work, as it ignites only at high temperatures and will therefore stand high compression in the cylinders, and hot cylinders without premature ignition.

CH_4—Marsh Gas.

A combustible gas. Heat value very high. 1070 B. t. u. per cubic foot. It forms by far the major portion of natural gas and about half of coal gas. An excellent gas for gas engines but not as good as CO to handle in a gas engine.

CO_2—Carbon Dioxide.

A non-combustible gas. Of no heat value. It is formed by the complete combustion of carbon. A producer should turn the heat value of the coal into combustible gases, principally CO. CO_2 being the result of perfect combustion shows that the producer is not working to its highest efficiency.

N—Nitrogen.

A non-combustible gas. It forms 79 per cent of the atmosphere. It gets into the gas with the air that is taken into the producer and its presence is unavoidable.

B. T. U.—British Thermal Unit.

British thermal units represent the heat value of any substance. One B. t. u. is the amount of heat required to raise one pound of water, one degree Fahrenheit. Natural gas having 888 B. t. u. per cubic foot, one cubic foot of natural gas completely burned will give off heat enough to raise 888 pounds of water, one degree Fahrenheit.

The B. t. u. column in the accompanying table represents the heat value of the various gases.

Manufacture of Gas.

Coal gas is made by the distillation of soft coal in a closed retort. Much tar and sulphur goes off with the gas, which has to be thoroughly washed out before the gas can be used, whether for illuminating or power purposes. But a comparatively small amount of gas is made from the coal, and there is left in the retort a considerable amount of coke.

Water gas is made by passing steam through red-hot carbon, such as coal or coke. The water, which consists of hydrogen and oxygen, is decomposed, the oxygen uniting with the carbon, burning it, and the hydrogen being liberated.

Producer gas is made by passing air through a thick bed of red-hot carbon. The oxygen of the air unites with the carbon of the coal to form carbonic acid gas (CO_2). Further along in the fuel bed the CO_2 is dis-associated, some of the oxygen uniting with more of the hot carbon, the result being carbon monoxide (CO). This passes from the producer, together with the nitrogen of the air, which nitrogen forms about half of the resulting gas. The gas as it passes from the producer is hot and dirty, so that it has to be washed by being passed through or sprayed with water. This gas, carbon monoxide (CO), will burn by taking up oxygen from the air, burning to carbonic acid gas (CO_2).

The usual gas producer consists of a brick-lined chamber, which contains a deep bed of red-hot fuel. The air is passed up through this fuel. Usually only fuels containing little or no gas, such as hard coal or coke, are used, because if soft coals are used the fresh fuel thrown on the hot fire distills off tar, sulphur and other products, which are extremely difficult to separate from the gas and which make the gas entirely unsuitable for gas engine use. This tar, etc., can, however, be separated from the gas and in the Medford power station are installed tar extractors for this purpose.

The Loomis-Pettibone producers, such as are used at the Somerville power station, are down-draught producers, as distinct from the usual up-draught producers just described. In these the air is drawn by means of a suction blower down through the bed of fuel. Soft coal can be used in these producers, as the products of distillation (such as tar, etc.) are broken up on passing through the deep bed of hot fuel, appearing in the gas, not as tar, but as hydro-carbon gases.

In the operation of producers, they get so hot that the ash is melted into a clinker, which is difficult to handle. To keep down the temperature, steam is introduced, the result being the making of water gas and the cooling of the fire. In the up-draught producer, the steam is continuously introduced with the air and the hydrogen resulting passes with the gas to the holder. In the down-draught producer, such as the Loomis-Pettibone, the steam is introduced intermittently. The top of the producer, which is ordinarily open, is first closed and the steam is introduced at the bottom and passes up through the fire. While steam is being introduced only water gas is made. This water gas is high in hydrogen, which is difficult to handle in a gas engine, and if passed directly to the holder and the gas engine would surely cause trouble. It is therefore passed into a separate holder, from which it is gradually introduced into the main holder, there mixing with the producer gas, but not in sufficient quantities to affect the operation of the engine.

Reducing the Size of Controller Boxes.

At the Sandusky shops of the Lake Shore Electric Railway an interesting method has been adopted for reducing the size and weight of the General Electric B-8 type of controllers, which were formerly used on the cars at Sandusky and of which a number are still in use. In addition to the regular controller apparatus the boxes contain the electric-brake cylinders which are no longer used. Some time ago a plan was devised for remodeling the controller boxes by tearing out the brake cylinders, removing the asbestos partitions and rewiring the controller cylinders. By so doing it was possible to reduce the size of the box by cutting away a part of the cast-iron case, thus narrowing it from 29 to 20 inches. The remodeled controllers are less intricate than the original ones and are correspondingly easier to repair.

NEW HECLA ROUTE OF THE WEST PENN RAILWAYS COMPANY.

The new line of the West Penn Railways Company, from the coke region to Greensburg, the county seat of Westmoreland county, Pa., which is already popularly known as the "Hecla Route," was opened for traffic on September 10.

The new line traverses a thickly populated section that has long been lacking in sufficient transportation facilities. Leaving the Scottdale-Mt. Pleasant line at the outskirts of Mt. Pleasant the road passes the plant of the H. C. Frick Coke Company, the largest in this region, containing 901 ovens and employing nearly 2,000 men. After passing the coke works the line traverses a rich farming country for some distance, then passes through Hecla, Armbrust and Youngwood. The Mammoth, United and Marguerite coke works are located sufficiently near to the line to serve as feeders. Youngwood, where the yards of the Pennsylvania Railroad are located, is a busy town of 3,000 population, and from Youngwood to Greensburg, a distance of five miles, the territory is so thickly settled as to form almost a continuous town, which furnishes a large local trade to Greensburg, which is a city of 15,000 inhabitants.

Through the farming territory the line is built on private right of way, with long tangents. The track is constructed in a substantial manner, of 70-pound T-rails laid on oak ties spaced two feet center to center, ballasted with stone broken to 2¾ inches. A top dressing of coke ashes eliminates trouble from weeds on the track. Streams of moderate size are crossed on concrete arches, some of which have 8x10-foot waterways, reinforced by T-rails sprung into the arches and extending back to the shoulders. At Armbrust the valley is crossed on a steel viaduct 600 feet in length, which spans the Sewickley branch of the Pennsylvania Railroad, the township road and Sewickley creek; this structure is designed with a large safety factor and is of a most substantial character.

Hecla Route, West Penn Railways—Steel Viaduct Crossing.

The standard West Penn system of manual-controlled signal blocks in duplicate, with the usual intermediate lights, has been installed, while the telephone line is just being completed. Four-motor equipments, such as are standard on the other West Penn lines, are being operated. The first Sunday after the line was opened the traffic was so heavy that large cars of the Narragannsett type were necessary, and over 1,300 fares were registered. Owing to the large number of local fares the five-cent zone system is used. Half-hourly service is being given, with one hour running time for the distance of 14 miles. Immediately upon the installation of an additional switch the time will be reduced to

45 minutes and through service to Connellsville instituted, making the time for the 26 miles one hour and 30 minutes, which is good time when the mountainous character of the country is taken into consideration. Shortly service will be extended through to Uniontown, the county seat of Fayette county, and ultimately to Brownsville, the extension from Uniontown to Brownsville having just been started. This will open up a section rich in coal and coke and bids fair to furnish more traffic than any of the lines now operated. The Leckrone line of the West Penn company is being extended to Gray's Landing, which will bring the line to the banks of the Monougahela river and furnish transportation facilities for the new coal-fields of Green county. Other extensions under way are a 12-mile line from Hecla to Baggeley, where connection will be made with the Latrobe Street Railway, a subsidiary West Penn property, and an extension of the Fairchance line to Shoaf, York Run and Smithfield. Several other lines are also contemplated, for which charters are now being taken out.

ADDRESS OF PRESIDENT ELY BEFORE THE ACCOUNTANTS' ASSOCIATION.*

A year ago we had reached the culmination of the formative work of the newly organized American association and its affiliated associations; you had elected your officers, the other associations had chosen theirs and we were starting forward on a new line of work. I must confess at this time that it was not without many misgivings on my part, and I have a very serious idea of the responsibility that devolved not only upon myself as president of the American association, but upon the presidents, officers and executive committees of your association and the others that are affiliated. Now, there were those who doubted what the result might be, but I should say that an inspection of the programmes for this convention, embracing that of the various associations, together with an inspection of the convention bulletin and the assembled data sheets which have emanated from the secretary's office during the past year, and added to that, an inspection of the lists of committees of the various organizations, ought to convince any fair minded man that we have finally got an organization nearly perfect in all of its parts, that, going on with such interest and the amount of time all these intelligent and brainy men devote to it, must ultimately work out a tremendous uplift throughout the whole business.

The work of the year, so far as our part of it was concerned, my part and Professor Swenson's, was rendered very much easier and was very much simplified by the very systematic and intelligent way in which your president and your officers arose to the occasion. All the misunderstandings and doubts were scattered like mists before the morning sun. There came about a perfect understanding of what was desired. On behalf of Professor Swenson, and myself also, I want to thank your president, your officers and yourselves, for the manner in which you have rendered assistance and taken hold of things during this past year.

With regard to the work that awaits you here, one thing stands out above all the rest, and that is the paper and the discussion that is to come on Thursday on "Depreciation as Applicable to Electric Railways." As you all know that is a question that is and has been creative of a great deal of trouble and doubt in the minds of the managing officers of the street railway corporations. There are those today who firmly believe that it is a question that ought not to be publicly discussed. I have been so busy for the last few days upon matters of great importance to myself, that I have had no opportunity to say, even to Mr. Brockway, that there are those who have spoken to me expressing doubt concerning the advisability of this discussion. Before the subject was chosen, Mr. Brockway, your president, with his customary thoughtfulness and foresight, outlined the matter with great care and was courteous enough to take it up with Professor Swenson and myself. We went all over it together. I thought that his suggestions were wise and timely, and the subject, as it is to be treated, I believe is all right and well chosen, and that the treatment that is proposed to be given it will be instructive and will lead to something that will be very beneficial. One communication which I received stated the writer's views very firmly. He took the position that he did not think that the auditors ought to be discussing this question. At the same time the only reason that I could spell out of it was that the writer did not think it was necessary to take up the question of depreciation, that necessity being relieved by the rapid increase in the value of franchises. Now, that reason does not appeal to me at all, and in the discharge of my duty as president of the American association I have seen fit to give my unqualified approval to your programme. I stand for that proposition and upon it, but trust that in your proceedings you will handle the matter with great care, that while you press forward and make progress with it, you will be careful that what you do may be done in such a way as not to be creative of harm to anyone.

I do not think that it is fair for any of us, street railway executive officers, directors, presidents or owners, to take the position that depreciation accounts are rendered unnecessary because of the appreciation in the value of franchises. Franchises, tracks and structures, cars, etc., are separate things. The depreciation of rolling stock, way, etc., it seems to me, ought to be taken care of, and should be in some way dealt with. Up to within a few years franchises have not been recognized to be assessable and taxable property. Today that is all changed, and throughout the country legislation is being enacted to reach the franchises of corporations and to tax them. I do not believe that the depreciation in tangible property of street railroad corporations can hereafter be taken care of by an appreciation of franchise values, because I believe that franchise values will be ascertained pretty soon in all the states and will be taxed. That result has taken place in a number of states already. If franchises are to be taxed then the argument of my friend is gone; it vanishes; there is no asset there to carry over on the other side and credit up to these tangible assets.

Then we come down to the question: If a franchise cannot be relied upon to take care of this depreciation, what is to be done? It has to be taken care of in some way, and some actual provision must be made for it. That is the way it looks to me. Now, it may be that we are not ready for it, and if we are not ready for it, of course we always have wisely to shape our action by all the circumstances that surround us. We are working for the good of all and taking hold of conditions, not single, isolated conditions, but the conditions that surround the whole business; and no great reforms are accomplished without the expenditure of a great deal of work and the lapse of a great deal of time. The world was not made in a day and we progress forward to better things very slowly. There are a great many corporations that at the present time could not stand, probably, charges for depreciation. Therefore, out of the whole situation as it exists, the facts and all that sort of thing, something must be brought with care, patience and labor. My understanding is that the manner in which you handle the matter will be simply to open it up, to approach it gradually and in an intelligent manner, not for the purpose of making recommendations that every one shall write off next year ten per cent for depreciation, or any such thing. You are approaching it, you are turning the light on it, you are examining it, to see how it can be taken up and what is the best thing to do. That is my understanding of the situation. I do not believe that will hurt anybody. I believe that it will do everybody good. So far as the stockholders are concerned

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*Delivered before the American Street and Interurban Railway Accountants' Association, Columbus, O., October 16, 1906.

I think they are entitled to dividends out of the surplus earnings of the corporation, if they are honest, true surplus earnings. I do not believe in the American policy of the accumulation of large surplus. I am opposed to that because I have seen those surpluses vanish so often mysteriously and in wrong ways. I think that when a corporation is in such a situation, first, that it is keeping its property up, that all the necessary arrangements are made to take care of the property; second, when it is paying proper wages, when it is paying everybody that which is coming to him—when all those things are taken care of, then I think that the surplus earnings ought to be distributed, pretty nearly all of them, to the stockholders of a corporation and not piled up for surplus. I believe that new properties and new extensions and acquisitions should be made out of the capital account and not out of the surplus account. If you pile up a surplus of twenty-five million dollars that surplus becomes a source of trouble, a source of temptation, to everyone that is concerned with the management of the corporation, and today the columns of financial newspapers and court calendars are full of the applications of minority stockholders to compel the directors of corporations to divide great big surpluses that have been accumulated, and of which the directors are making use, so it is charged, and so undoubtedly it is shown to be in many cases, for their own ends rather than for the ends of any of their stockholders. Now, all those things are bound to be eliminated, all those things have to be cut off. I believe that the whole situation is changed, and that the sooner we recognize it the better; and who cannot recognize it, the worse he is off.

Why I approve of this discussion in the main is because it seems to me it is the very best evidence that there is a spirit of progressive intelligence and understanding of things present in the Accountants' association. So far as I am concerned I congratulate you that you have had the good sense to see these situations and to approach them carefully. Of course, I would not suggest for a moment that you should do anything rash or proceed in any ill considered way. I do not think you have ever done anything that exposes you to any such charge as that. On the contrary, I would trust any interest to the Accountants' association.

I not only wish your organization a continuation of success, but to each and every one of you personally I extend my heartiest wishes for your prosperity and happiness. That everything that is good may come to you is my earnest wish. I am very glad to have had the pleasure of meeting you.

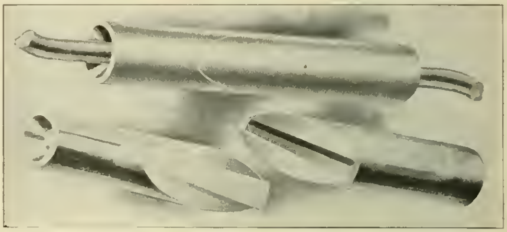
I omitted to say something which you know so much better than I that my only reason for adverting to it, probably, is to show you that I know about it too. I want to contradistinguish the American method of piling up surpluses from the English method, which is to divide them up among the shareholders, as you all know. I think the English method is right, and I think the proof of the pudding is in the eating of it, when they have used it so successfully through all of these hundreds of years; and I do not think there is very much to be improved upon in the English business methods, anyway, as a general rule.

In the car shop of the International Railway Company, Buffalo, N. Y., the graining of window sash and other small wooden parts is done by a transfer process. The copy consists of a dressed plank of mahogany, cherry, oak or other wood, as the case may be. The corresponding stain is brushed upon the copy plank, the surface of which is then scraped. A roller about 14 inches in diameter and 10 inches width of face covered with composition similar to that used on printing-press rollers is then rolled over the copy plank, receiving the pattern of the grain of the wood. Two of the sash to be grained are laid side by side, so that one passage of the roller marks one element of each sash. One man does this work and can transfer the grain pattern to the set of 32 sash needed for one car in a day.

A SIMPLE TERMINAL CONNECTOR.

A new two-way terminal connector has recently been patented by Mr. C. E. Atkinson, master mechanic of the Richmond shops of the Indianapolis & Eastern Traction Company. A few of its credited advantages are that it makes a positive connection, allows no corroding of joints, prevents the commutator troubles due to loose connections, and that by its use a connection can be made or broken with ease and rapidity.

The connector, which is herewith illustrated, was designed originally for joining car cables and motor leads without the use of screws or clamps, but it can be used wherever it is necessary to join two leads. It consists of two brass soldered terminal cylinders which are fitted together by means of a male and female wedge-shaped joint, the contact surfaces being machined to a close fit. As the side surfaces of the dove-tail diverge it is impossible for the connection to break without the parts sliding back the length of the contact surface. When the connector is used on motor leads only a small amount of tape is required to make a perfect exterior insulation. A slight stroke with a hammer after the tape is removed will allow the connection to be broken. The connector can be made in any size desired.



Simple Terminal Connector.

DIRECTORY OF ELECTRIC RAILWAY ASSOCIATIONS.

American Street and Interurban Railway Association. Secretary, Bernard V. Swenson, 60 Wall street, New York.

American Street and Interurban Railway Accountants' Association. Secretary, Elmer M. White, assistant treasurer Birmingham Railway Light & Power Company, Birmingham, Ala.

American Street and Interurban Railway Engineering Association. Secretary, S. Walter Mower, general manager Southwestern Traction Company, London, Ont.

American Street and Interurban Railway Claim Agents' Association. Secretary, B. B. Davis, claim agent Columbus Railway & Light Company, Columbus, O.

American Street and Interurban Railway Manufacturers' Association. Secretary, George B. Keegan, 2321 Park Row building, New York, N. Y.

Canadian Street Railway Association. Secretary, Allan H. Royce, vice-president Toronto Suburban Railway, Toronto, Ont.

Central Electric Railway Association. Secretary W. F. Millholland, secretary and treasurer, Indianapolis Traction & Terminal Company, Indianapolis, Ind. Meetings held every two months, except during the summer, on the fourth Thursday of the month.

Colorado Electric Light Power & Railway Association. Secretary, John F. Dostal, Denver Gas & Electric Company, Denver, Colo.

Iowa Street and Interurban Railway Association. Secretary, L. D. Mathes, general manager Union Electric Company, Dubuque, Ia. Next meeting, Clinton, Ia., May, 1907.

Massachusetts Street Railway Association. Secretary, Charles S. Clark, 70 Kilby street, Boston, Mass. Meetings held in Boston on second Wednesday of each month, except July and August.

Northwestern Electrical Association. Secretary, B. Adams, Madison, Wis.

New England Street Railway Club. Secretary, John J. Lane, 12 Pearl street, Boston, Mass. Meetings held on fourth Thursday of every month.

Pennsylvania Street Railway Association. Secretary, Charles H. Smith, superintendent Lebanon Valley Street Railway, Lebanon, Pa.

Southwestern Electrical & Gas Association. Secretary, C. B. Meginnis, manager Dallas Gas Company, Dallas, Tex.

Street Railway Association of the State of New York. Secretary, C. B. Fairchild, Jr., Caxton building, Cleveland, O. Quarterly meetings.

Wisconsin Electric and Interurban Railway Association. Secretary, Clement C. Smith, president Columbia Construction Company, Milwaukee, Wis.

THE MUNCIE & PORTLAND TRACTION COMPANY.

The new line of the Muncie & Portland Traction Company is 31.7 miles long and is desirably located for the operation of cars at high speeds. The track for 26.7 miles is on a private right of way. The terminal cities are county seats. The smaller towns along the line are thriving farming centers and the intermediate territory served by the line is thickly populated.

The Muncie & Portland Traction Company was organized by Mr. George F. McCullogh, of Muncie, Ind., July, 1905. Construction work was begun the following month and the line was completed and opened for traffic on June 1, 1906. The officers of the company are: George F. McCullogh, president and general manager; Frank Ball, treasurer; J. L. McPhearson, secretary; William Cummins, engineer and superintendent of construction, Muncie, Ind. The board of directors is composed of the president, secretary and treasurer and Messrs. George Ball, Edwin Ball and William Ball.

Muncie & Portland Traction Company—Type of Deck-Girder Bridge with Concrete Piers and Abutments.

The line serves an estimated population of 60,000 people distributed as follows: Muncie, 30,000; Albany, 1,600; Dunkirk, 4,200; Red Key, 2,600; Portland, 6,600; rural districts, 15,000. The line enters the new terminal station at Muncie, at which place the company has obtained interchange arrangements for passenger and freight traffic with connecting lines, thereby increasing its possible transient patronage to some extent. This terminal station was described in the Electric Railway Review, October 1906, page 628.

Roadway and Overhead Construction.

The track parallels the Lake Erie & Western railroad from Muncie to Albany and from Red Key to Portland. At Albany it takes a northerly direction to the city of Dunkirk, and after passing through the principal street of this town runs southeast to Red Key, parallel with the Pennsylvania railroad, and again turns northeast to Portland.

As soon as possible work will begin on the extension of the track from Portland to Celina, Ohio. Surveys for this extension have been made over two routes, one being almost an air line between the two cities and the other veering to the southward to serve several small towns in eastern Indiana. As yet neither route has been definitely decided upon. The distance between Portland and Celina by the air-line route is 23.4 miles. If this route is selected a 17-mile tangent will be one of the favorable features of the line.

Much care has been given to the details of the track and roadbed construction of the line now in operation. Except in cities no curve has a radius less than 2,000 feet. To attain a line free from short radius curves it was found desirable in some of the towns to purchase private property.

The maximum grade is 1½ per cent and this is for less than 1,000 feet. The grade on the rest of the line is less than one per cent. No excessive cuts or fills were necessary to maintain this low grade. There is one fill 500 feet long, between Dunkirk and Albany, that is 16 feet high.

The sub-grade is 16 feet wide on top. The track is laid with crushed rock for ballast. Up to this time 2,300 yards of ballast have been used for each mile of track. An additional 200 yards per mile will be placed in the finishing process.

Careful attention has been given to the details of proper road-bed drainage. Ditches extend along both sides of the sub-grade in cuts and wherever necessary to carry the surface water to natural outlets. Tile are used in carrying the water under the farm crossing approaches.

Concrete was used exclusively in building waterways and abutments for the bridges spanning the larger waterways crossing the right of way. Where bridges were necessary the deck girder type resting on winged concrete abutments was used. There are five bridges of this type on the line, the longest of which has three 65-foot spans. Besides the girder bridge construction there are several 7-foot concrete arches.

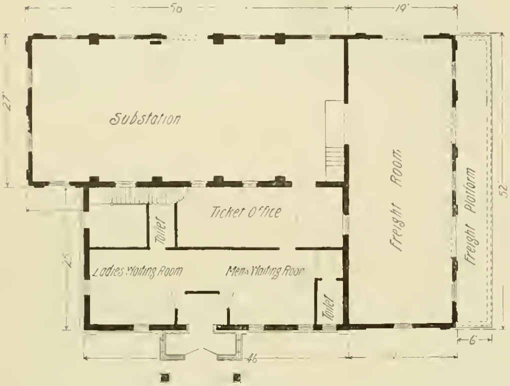
Five grade crossings are made with steam railways between the terminal stations. As three of these are made within the city limits where the speed is necessarily reduced and the others are with unused portions of switches, the fast schedules are not interfered with to any extent.

The track is laid with 70-pound Carnegie steel in 33-foot lengths on standard white oak ties spaced 24 inches between centers. The rails are electrically joined by American Steel & Wire and "flexible mesh" bonds soldered on the ball of the rail. Twenty-four-inch angle bars are used. The track is cross bonded every 1,300 feet and at all switches and turnouts.

The pole line is composed of 40-foot Idaho cedar poles set 6 feet in the ground and 100 feet apart. A No. 000 trolley wire is suspended on tubular iron brackets, except at curves, where the span wire construction is used. In addition to the trolley wire the pole line carries a 500,000-circular mil copper feeder which runs the entire length of the line, two telephone wires and, between the power house and substation, the three-phase high-tension line. Lightning arresters are located on the poles at intervals of 1,300 feet.

Power House.

The power house location, two miles west of Portland, was selected so that it will be as near as possible to the center of the line when the track is extended east of the present terminus at Portland. The building is of brick and steel. Coal is delivered by a steam road siding to a storage bin 15 by 64 feet in area located at the rear of the boiler room. This is an elevated track over the storage bins, so that the supply can be dumped from cars to the bin directly in front of the boilers.



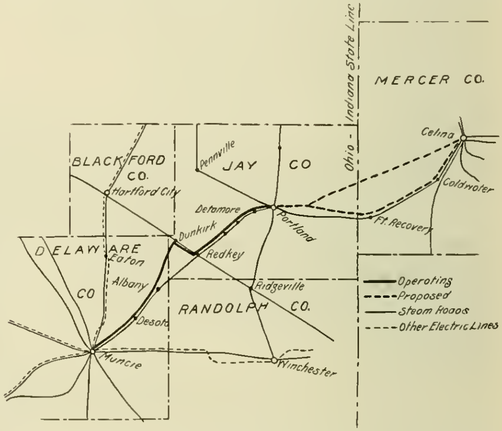
Muncie & Portland Traction Company—Floor Plan of Waiting Room and Substation at Albany.

Muncie & Portland Traction Company—Exterior View of Waiting Room and Substation at Albany.

In the boiler room, 46x76 feet, are two Altman & Taylor boilers with a rated normal capacity of 300-horsepower each. They are arranged in one setting and are worked at a steam pressure of 165 pounds. The boilers are hand fired. Plans are now under consideration for doubling the capacity of both the engine and boiler equipments to care for the extension to Celina, O.

The feed water supply is drawn from the Salamoni river and is carried a distance of 474 feet through a five-inch main to the power station. The water is pumped into an elevated tank of 650 barrels capacity and allowed to run by gravity into a Cookson heater and filter which is located in one corner of the engine room near the three service pumps. The water is delivered to the boilers at 208 to 210 degrees Fahrenheit. The pumps used are 10 by 6 by 12 inches in size. The arrangement of the pipes leading to and from the pumps is one of the interesting features of the station. As shown in the accompanying illustration, the pipes are carried overhead. Each pump has a five-inch suction and a three-inch discharge. The pumps are also provided with auxiliary 2½-inch discharge pipes and any one of the three pumps can supply water from the river to the tank or from the heater to the boiler or can be cut into the general service main to serve water to other parts of the power station, or to the car barn, or for fire protection purposes.

In leading the steam pipes from the boilers to the engines the general scheme of overhead suspension has been adhered to. The main header, 12 inches in diameter, is located near the center of the building and along the fire wall between the engine and boiler rooms. Eight-inch connections lead from the boilers to the header and five-inch pipes from the header to the engines. The angles are turned with long-radius bends. The free exhaust is carried to the atmosphere through a 10-inch exhaust line connecting with a 12-inch exhaust header which pipes are placed in the basement. The high-pressure steam pipes are covered with an 85-per cent magnesia composition.



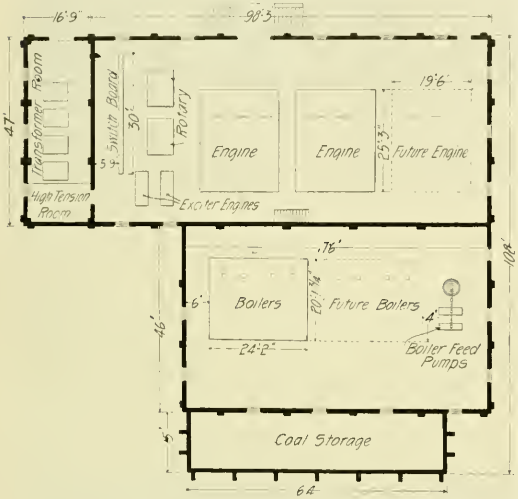
Muncie & Portland Traction Company—Map Showing Completed and Proposed Routes.

The engine room, 47x98 feet, has 20-inch side walls. The generating units are driven by two Allis-Chalmers, cross-compound 16 by 26 by 36 inch, Corliss engines with a rated capacity of 500-horsepower each. The fly-wheels are 14 feet in diameter, have 14-inch faces and weigh 30,000 pounds. Each engine is direct connected to a 300-kilowatt, 410-volt, 25-cycle, alternating-current Westinghouse generator, which is operated at a speed of 107 revolutions per minute. There are two 17½-kilowatt, 125-volt exciters. These units are so connected that either may supply exciting current for one or both of the main generators. In addition to the generating units a substation equipment consisting of two 300-kilowatt, 650-volt, rotary converters is located in the power house. The rotaries take current at generator voltage.

The main switchboard is composed of eight panels of gray marble and is equipped with a Tirrell regulator, knife switches, ammeters, voltmeters and the equipment necessary for controlling the output of the station. A complete gravity oiling system has been installed in the engine room.

The transformer and high-tension switch room occupies the east end of the building. It has a floor area 17x47 feet. A novel feature of this room is the fire and water proof pit provided for the transformers. This is 10 feet deep and is designed for protection of the rest of the building from fire in case the oil-cooled transformers should burn. The pit also aids in keeping down the temperature of the transformers during warm weather. The floor and side walls of the pit are built of concrete. The equipment consists of three 300-kilowatt, 410-33,000-volt, transformers. Conduits laid under the main floor connect the engine and transformer rooms.

Above and to the rear of the transformer pit, on a level with the engine-room floor, the high-tension switches and low-equivalent lightning arresters are located. In leaving the transformers the high voltage lines are carried through the north wall of the building through wall insulators and are led direct to the main high-tension line which follows the company's right of way to the substation at Albany, a distance of 18 miles to the west.



Muncie & Portland Traction Company—Floor Plan, Main Power Station.

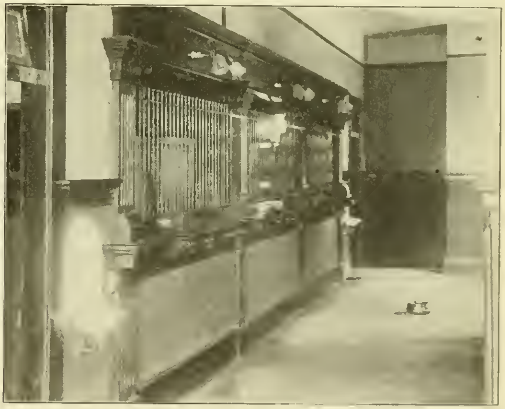
Substation.

The substation building at Albany occupies a ground area 75 by 52 feet. It is built of brick with cement cornices, window sills and cement coping. The building is artistic in design and provides commodious waiting rooms, offices, freight storage space and a large transformer room. Much care was given to the general arrangement of the building.

The waiting room and offices, which occupy the front part of the building, have a floor area 25 by 46 feet. The woodwork of these rooms is finished in a dark green color, the walls are calcimined in the same tint, and the ceiling covered with paper of a lighter shade which adds beauty to the general appearance of the rooms. In the waiting rooms a green burlap wainscoting extends from the mop board to a height of 4½ feet. The floors are laid with hardwood oiled flooring. Between the waiting room and the ticket office, ticket windows, as shown in the illustration, are provided at a height of 4½ feet from the floor. In front of these openings polished brass grills are used. The rooms are lighted with clusters of incandescent lights which are supplied with current from the alternating-current side of the rotaries. The ladies and men's waiting rooms are joined by a hallway which extends in front of the ticket office. Toilet rooms are arranged for the convenience of the patrons of the road.

Muncie & Portland Traction Company—Exterior of Main Power Station.

The rotary room is 27 by 56 feet in floor area and is located at the rear of the office room. The equipment consists of rotary converters and transformers of the same capacity as are used in the substation equipment at the power house. The high-tension stick switches, transformers and switchboard are arranged along the east wall, and the rotaries are installed in the north end of the west half of the room. The room provided for the receiving and storage of freight is located immediately north of the transformer room. This room is 19 by 52 feet in floor area. The floors of the freight room are elevated about four feet above the floors of the rest of the building. By this arrangement freight can be exchanged from the car to the freight house without heavy lifting. A platform 6 feet wide runs along the north side of the building. A switch track leads from



Muncie & Portland Traction Company—Interior of Waiting Room.

the main line in the street to the doors of the freight house.

Shops and Barns.

The car barns and shops are located a short distance to the north of the power house. The building is also of brick and steel construction, 90 by 176 feet. The main building is divided into parts suitable for car storage, repair work, inspection, storage and office purposes. The shop is equipped with necessary machinery for doing repair work of all kinds.

Rolling Stock.

The rolling stock includes five combination baggage and passenger cars, one express car and one work car. The express car is equipped with four Westinghouse 75-horsepower motors. The five combination cars are operated single-ended and were built by the Cincinnati Car Company.

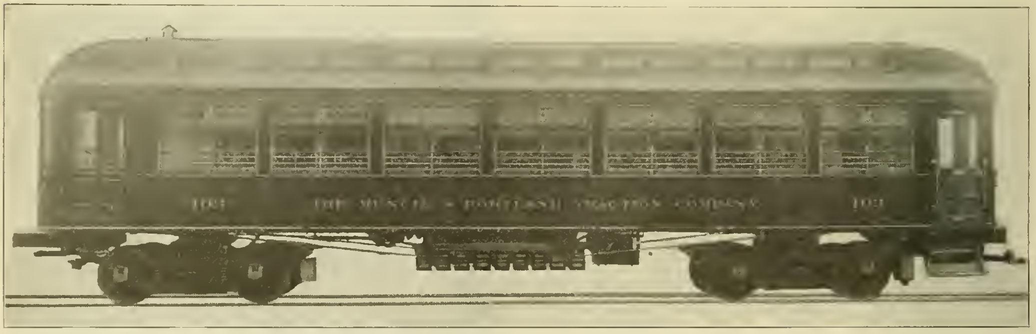
Each car has plush upholstered seats in the main compartment for 34 passengers. This compartment is 34 feet 6½ inches long and has a toilet room at one side of the rear door. The interior finish of the main compartment is of redwood. The smoking compartment, ahead of the general compartment, is finished in golden oak as are the vestibules. The seats in the smoker are longitudinal along the sides. Each seat extends the whole length of the smoker, 10 feet 8 inches. Ahead of the smoking compartment is a space 9 feet ½ inch long set apart by a partition, for the motorman and baggage. The forward division of the car has one door on the left side. When not fully occupied by baggage folding seats along the sides may be used by passengers. The hot water heater is placed in the baggage compartment close to the smoking compartment partition. The total seating capacity of the car is sufficient for 50 passengers.

The cars are 50 feet 7 inches long over bumpers, 48 feet 9 inches long over vestibules and 8 feet 8 inches wide over all. There are seven double windows on either side of the car, each made up of two openings filled with plate glass 23 by 33 inches in area. Each car is mounted on Baldwin trucks, and has four Westinghouse No. 93 motors, with a unit-switch control. Thirty-four-inch forged steel wheels are used. The wheel base of the trucks is 77 inches. Westinghouse straight air-brakes, schedule SMI, are used with American slack adjusters.

Muncie & Portland Traction Company—Exterior View of Car Barn Near Portland.

Operation.

The operating methods in use on the line do not differ to any extent from those of the Indiana Union Traction Company, with which company the Muncie & Portland Traction Company is closely allied. Cars are started at Muncie at 5:30 a. m., and at Portland at 5:20 a. m. daily, and a 60-minute schedule is provided until 6:20 p. m., after which cars are run every two hours until 11 p. m. The run from Portland to Muncie, 31.7 miles, with its six regular station stops, and 20 road crossing flag stations is made in 70 minutes. These conditions necessitate quite high speeds between stations. As three cars are regularly kept on the run, a 25-minute layover is afforded at each terminus. This is advantageous in keeping the cars on schedule inasmuch as cars that are delayed less than the time allowed for layovers, can again be started out on schedule time.



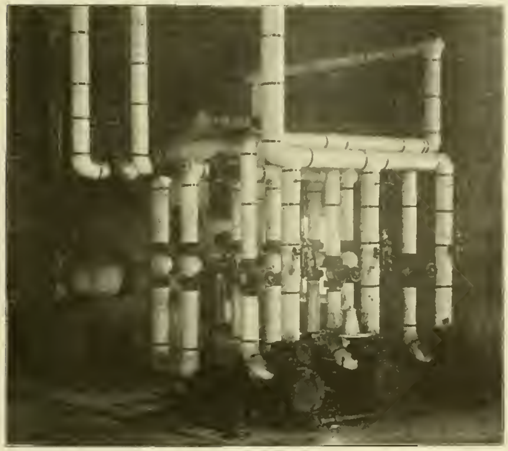
Muncie & Portland Traction Company—Standard Passenger Car.

Interline tickets are sold to any point on the lines of the Indiana Union Traction Company. A charge of two cents a mile is made for all one-way tickets or cash fares and a ten-cent reduction is allowed on round trip tickets between Portland and Muncie.

Regular ticket and freight agents are stationed at Portland, Como, Red Key, Dunkirk, Albany, De Soto and Muncie. The rates charged for the carrying of freight are in accordance with the official railway classification for the state of Indiana. The company has no traffic arrangements for the interchange of freight with steam roads.

Since the line was opened for traffic it has been necessary to run two freight cars each way on week days and the business has grown to such an extent that another car will be put on the freight run at an early date. The freight cars leave Muncie at 10 a. m. and 4 p. m., and leave Portland at 7 a. m. and 1:30 p. m., daily, except on Saturdays and Mondays, when they leave the terminal stations 2½ hours later.

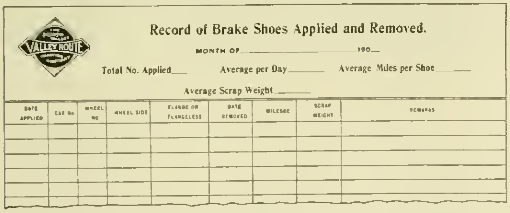
The train dispatching is directed from the main office at Portland over a private telephone system which runs the length of the line. All cars are provided with portable telephones and jack-boxes are placed on either side of the track at turnouts so that connection can be made without leaving the car vestibules. Orders issued from the dispatcher's office are written out by the crews on blanks provided for the purpose and O. K.'d by the dispatcher before a car is allowed to proceed.



Muncie & Portland Traction Company—Piping for Heaters and Pumps in Main Power Station.

A BRAKESHOE RECORD BLANK.

Mr. C. Skinner, master mechanic of the Scioto Valley Traction Company, has found it very advantageous to keep accurate shop records of all brakeshoes used on the cars of his company. In order to simplify the work of gathering the desired data the printed form herewith illustrated is used. The Scioto Valley Traction Company uses only the flangeless type of brakeshoe. Its shops are located at Reese's Station, O., a short distance from Columbus.



Record of Brake Shoes Applied and Removed.

MONTH OF ________ 190__

Total No. Applied ______ Average per Day ______ Average Miles per Shoe ______

Average Scrap Weight ______

DATE APPLIED	CAR No.	WHEEL No.	WHEEL SIDE	FLANGE OR FLANGELESS	DATE REMOVED	MILEAGE	SCRAP WEIGHT	REMARKS

Scioto Valley Traction Company—Brakeshoe Record Blank. (Original 8½ by 13 inches.)

The government of Ecuador, S. A., has requested bids for the construction of a steam or electric railway from Ambato to the river Arajuno.

GENERAL SETTLEMENT ORDINANCE AS A SOLUTION OF THE CHICAGO TRACTION SITUATION.

The Chicago City Railway Company on October 25 presented to the local transportation committee of the Chicago city council the draft of an ordinance for a final settlement with the municipality in regard to the operation of the street railways. The Chicago Union Traction Company at the same time announced that it would also submit an ordinance embodying practically the same ideas. This ordinance, which is the result of several conferences between the city's traction experts and the companies, closely follows the plan outlined in Mayor Dunne's letter to Alderman Werno in April of this year, the principal feature of which was that the companies should be given a license to operate for an indefinite term of years to be terminated by the city at any time upon six months' notice, instead of a franchise grant. Several points, such as the estimate of the valuation of the property and the compensation to be paid the city, have been left open for discussion with the committee, but the ordinance is believed to have removed the main points of difficulty.

The principal features of the "general settlement" ordinance are that the two companies are to be given a license to operate street railways for an indefinite period, the city reserving the right to purchase the property on the first day of any year within 20 years, upon giving six months' notice. The companies shall reconstruct the lines and put them into first-class condition. Net receipts are to be divided between the companies and the city. A subway system shall be built by the companies in partnership with the city, the companies' investment for this purpose being limited to $5,000,000 within the first five years. Supervision of the reconstruction and operation of the lines is to be by a board of supervising engineers, appointed one by the city, one by the companies and one by these two.

The following is a brief digest of the principal features of the ordinance:

Section 1. Gives authority to the company to construct, reconstruct and operate street railways in streets designated in Exhibit A. Where rights are given to both companies in same streets such rights shall be for joint use of tracks.

Section 2. The company shall proceed at once to reconstruct its system, putting it in first-class condition in accordance with specifications in Exhibit B, except that it may use better materials than those specified.

Section 3. Extensions and additions may be required by the city under the supervision of the board of supervising engineers.

Section 4. The motive power shall be electricity applied by the overhead contact trolley system "or otherwise as more particularly set forth in Exhibit B," except that the city, subject to the limitations of Section 23, may at any time within — years, require that the companies operate by the underground conduit system.

Section 5. The city shall have the right to use, free of cost, the company's poles to carry wires and lamps, except wires carrying over 1,000 volts. All city wires are to be installed without cost to the company, but the company shall repair and maintain the poles. The city shall indemnify and save harmless the company against and from all damages or expenses due to the negligence of the city in installing, maintaining or using the wires and lamps.

Section 6. The company may be required by ordinance to join with the city and the Chicago Union Traction Company in defraying the cost of a system of subways to be used jointly by the companies as downtown terminals and by the city and its licensees. The subway shall not be used for street railway purposes except by the companies contributing to its cost. The amount to be expended by the companies shall not exceed $5,000,000 in the first five years nor shall it exceed the pro rata cost of that part of the subway which is to be devoted to the use of the companies, and two-fifths of the cost shall be borne by the Chicago City Railway Company and three-fifths by the Chicago Union Traction Company. The company shall not be required to contribute to the cost of a subway until the system shall have been authorized by ordinance with specifications for its construction and use and until the board of engineers shall have approved the plans and specifications. When the subway shall have been completed the company may be required to join with the city and the Chicago Union Traction Company in paying for extensions and additions. The company is to have the right to continue operating cars on the surface of the streets which are used for subways.

Section 7. All construction, equipment and addition shall be done under the supervision of the board of engineers who shall report each month to the city comptroller the amount expended for such work, and the amount plus — per cent as a fair profit shall be binding as the cost of the work to be paid by the city in case of purchase.

Section 8. The company shall remove all tracks not authorized by this ordinance, and all tracks hereafter becoming unused shall be removed by order of the city council. Failure to operate cars at least once an hour between 6 a. m. and 8 p. m. shall be deemed cessation of operation. When tracks are removed the company shall restore the condition of the street to that of other portions thereof.

Section 9. The company shall not sell any of its property except as it shall become unnecessary or unfit for proper maintenance and operation of the system, and upon the approval of the board of engineers.

Section 10. All reasonable regulations of service, approved by board of engineers are to be complied with "so as to give the public the best service practicable." (Various requirements in regard to condition and style of cars are included in this section.) At least — cars of the prescribed pattern shall be acquired and placed in use within one year. Single cars only to be run after one year.

Section 11. The fare shall be five cents for a continuous trip in one general direction within the present limits of the city, and three cents for children between 7 and 12 years of age. Universal transfers are to be given, including transfers on transfers for a trip in the same general direction. Transfers are to be interchanged with the Chicago Union Traction Company except north of Twelfth street prior to the completion of the subways.

Section 12. No passes of any kind are to be given and no persons except employes, policemen and firemen, in uniform, shall be carried free.

Section 13. The company shall co-operate with the other companies to establish through routes, as provided in Exhibit C, and shall establish new through lines as may be required by the city.

Section 14. The company shall sprinkle, sweep, keep clean and free from snow its right of way.

Section 15. The company shall pave and keep in repair that portion of the streets occupied by it. Grooved rails shall be used in all streets hereafter paved or repaved and for all new tracks.

Section 16. The property is to be maintained in first-class condition and to this end — dollars per year shall be expended.

Section 18. The salaries of directors, officers, agents and attorneys are to be fixed by the company, but if the city shall object to a salary as excessive the matter shall be decided by the board of engineers.

Section 19. The city reserves the right to take over the property on the first of any of the next 20 years upon six months' notice, but within 20 years may purchase only for municipal use and operation. Should the city so purchase it shall pay the aggregate of the following items: 1. The value of the physical property plus the value of the present unexpired franchises, fixed at —— dollars. 2. The value of all property acquired after inventory of July, 1906. 3. The cost of reconstruction and all improvements, additions and extensions.

Section 20. If the city shall purchase during the reconstruction period it shall take over the property subject to the right and obligation of the company to complete the cost of reconstruction and to receive therefor the cost of the work, plus the additional percentage provided in Section 7 as a fair profit.

Section 21. If the city does not purchase the property within 20 years it may designate a licensee to purchase the property on the same terms as the city could then purchase. If the city shall grant to another company the right to operate over the company's tracks at the end of the 20-year period, the new company shall be required to purchase the property on the same terms.

Section 22. Settlements are to be made with the city each year and the net receipts divided so as to give — per cent to the company and — per cent to the city, less amounts paid to the city as license fees. At any time the city may commute its share into a reduction of the rates of fare.

Section 23. After the completion of the reconstruction the company shall not be required to increase its capital investment to such an extent that the interest thereon would reduce the company's share of the net receipts below an amount deemed reasonable by the board of engineers.

Section 24. The annual reports are to be complete and detailed and the city comptroller is to have the right to examine the company's books at all reasonable times.

Section 26. Should the company make default of any of the agreements for a period of — months (unavoidable accidents, etc., excepted) the city may declare the company's rights forfeited. Such forfeiture shall not impair the rights of holders of any pledge or mortgage against the company.

Section 27. By accepting the ordinance the company waives all its rights and claims in the streets under previous ordinances or acts.

Section 29. The board of supervising engineers shall be appointed within — days after the acceptance of the ordinance, one to be appointed by the company, one by the mayor with the approval of the city council, and the third by the first two.

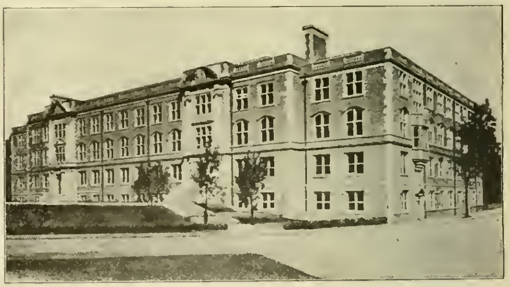
Section 31. Should the ordinance to be submitted by the Chicago Union Traction Company not be accepted the company agrees to extend its system to the streets now occupied by the Chicago Union Traction Company and to carry out the provisions of the ordinance for that company's system.

Since this ordinance was submitted the mayor and the city's traction advisers have demanded amendments giving the city the right to take over the street railway lines by means of a holding company on the contract plan, and providing for paying the capital stock tax out of the company's share of the net receipts instead of charging it to operating expenses. The companies have not yet stated whether they will agree on these points. The ordinance was considered at a meeting of the local transportation committee on November 8 and the mayor and some of the aldermen expressed the opinion that too much authority had been given to the board of engineers. The mayor also objected to the provision in Section 2 providing that the companies may use better or more expensive materials than those specified, taking the position that they should not make such extravagant improvement that the city cannot afford to buy the property. The clause was stricken out. Mayor Dunne stated after the meeting that he would never favor three-cent fares, saying "Where would we get the money to buy the lines? After we get municipal ownership we can talk of three-cent fares." As three-cent fares would materially reduce the city's share of the net receipts it is easy to appreciate the mayor's position.

There now seems to be a strong probability of a settlement of the question along the lines of the ordinance before the first of the year. The figures for the valuation of the companies' tangible property by the city's experts have not yet been published, but it is now believed that these will present no serious cause for disagreement, as Mr. Arnold has stated that they will not be far from the companies' estimate. The general settlement plan has been approved by the New York interests and Kuhn, Loeb & Co. have agreed to finance the rehabilitation, which it is estimated will cost about $50,000,000.

UNIVERSITY OF PENNSYLVANIA ENGINEERING BUILDING.

The new three-story building just completed for the use of the engineering department of the University of Pennsylvania at Locust and Thirty-third streets, West Philadelphia, Pa., was dedicated on October 19, with appropriate exercises. Invitations for private inspection of the building on that date were issued and the building was thrown open to public inspection on October 20.


New Engineering Building, University of Pennsylvania.

Though nominally of three stories, the location of the building is such as to afford a basement which on two fronts is practically above ground and can be utilized for various laboratory and other purposes. Other floors will be occupied by class rooms, laboratories, drawing rooms and offices, of which the equipment is of the first order. The funds for the erection and equipment of the building have been derived from various sources, the Baldwin Locomotive Works, among others, having made substantial donations on two occasions.

The San Antonio, (Tex.) Traction Company is planning to erect a club house for its employes near the car barns on San Pedro avenue, San Antonio.

PIPING AND POWER STATION SYSTEMS.—XXIII.

BY W. L. MORRIS, M. E.

If the principal impurity in water is sand or small particles a better filter can be constructed with a series of screens, as in this case the mesh would be uniform and as fine as desired, this quality being unattainable with excelsior or other fibrous materials.

A method of constructing such a filter box with screens is shown in Figure 223-(F4-4). Water from the condenser enters at a, and discharges at b, the oil passing over the overflow. The four tension rods are provided with handwheels, c, and are supported at the opposite end of the box in the bearings, d, which will permit of rotation. The frame, e, is metal with threaded connections to the tension rods; the frame, f, is also made of metal, but is attached to the shell of the tank. The frames, g, are of cypress or other wood that will wear well in water and support the screens. If it is desired to remove the screens from the frame, g, the frame, e, is released with the handwheels, c. This allows the screens to be lifted off of the upper rods.

In operation the water enters through the metal frame, e, and passes through all the screens to the pump suction as shown in the illustration. If there is a slight leak around the frame no difficulty will be occasioned unless the leak opening is so large that the filtered impurities can pass through it. Ordinarily the tension on the screws will prevent this leakage. The filtering material may be cloth instead of metal and when the screens are being removed they should first be washed in the water in the box, thus allowing the impurities to remain in the tank and be taken out at one time, when all the screens are removed. The screens may be graded in mesh starting with coarse metal and finishing with fine cloth. Such a device may strictly be called a filter and operates very satisfactorily in removing fine silt and mud. If a connection is provided for draining the bottom of the box the screens can be washed with a hose without removing them, but they should first be loosened by releasing the clamp screws. A gauge on the suction pipe will serve to show the condition of the screens.

Suction Branch from Intake.

A suction branch from the intake should be provided in addition to the suction line from the hot-well as at any time it may be found necessary to shut down the condensing apparatus. If two or more pumps are used the suction lines should be arranged so that the feed pumps may be using hot-well water while the general service water is taken from the intake. This arrangement would be quite essential in a plant having journals or any other apparatus water-cooled.

Suction Branch from City Water Mains.

It is invariably good practice to provide a suction connection with the city water supply which can be used in case of need even though a plant has its own source of water supply as from a stream, canal, pond or deep well. The city water should discharge into an open well or at a point that will be suitable for the pump suctions. The connecting of city lines direct to pump suctions will cause some difficulties, but if such connections must be used an air chamber should be provided which will prevent water-hammer in the city water lines, meters, etc. The fact that the suction water comes to a pump under pressure is more of an advantage than otherwise as the work of the pump is lightened and difficulties from air in the lines are eliminated. Any pump will operate more satisfactorily with the pressure head on its suction.

If the city water is connected direct to the pump suction and the other suction be from a well, stream or the like, there should be a foot valve at the regular low-pressure suction so as to avoid any possibility of wasting city water back through the regular suction. Ordinarily it is advisable to place a vacuum gauge on the pump suction, and in case city water is also used this gauge should be compound, showing both pressure and vacuum. With such a gauge as normally operated the attendant can quickly note any change brought about by altered conditions, thus enabling him to remedy a difficulty before it becomes serious. Such troubles may be from the foot valve, pump-suction valve, accumulation in suction line, city water under pressure leaking past its stop valve or from numerous similar causes. The saying "A stitch in time saves nine" is very applicable in station operation, and such devices as aid in anticipating trouble in power stations are well worth the expense of installation.

Suction Branch from Economizer.

The suction branch from the economizer is only used where boilers are operated under an extremely high pressure, say 200 pounds, and where it is desired to operate the economizers under a low pressure, say 40 pounds. Such a system was shown in Figure 6, which may be found in an early chapter. The chief requirement of the suction line from the economizer is that it may be maintained under the set pressure of 40 pounds, if it be so set, thus avoiding the possibility of the hot water from the economizer forming a vapor. At 40 pounds pressure water can be heated as high as 286 degrees F. before difficulty will be encountered from steam vapor in the feed-pump suction. If, however, the economizers raise the temperature of the water above this point, which would be a rare case, the pressure may be increased sufficiently to avoid vapors. The pump cylinders would show slightly less pressure than the line to the pump, possibly two pounds, which would necessitate raising the pressure a like amount to balance this loss.

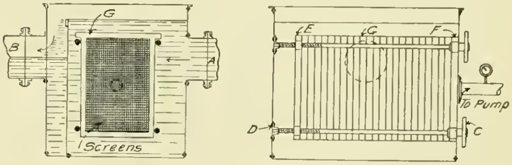


Figure 223—(F4-4).

The pump which supplies an economizer must be sensitive to pressure and preferably should have a governor which controls for a fixed pressure. If the lowest pressure be above a possible steaming point no serious result would arise if the pressure in an economizer varied within a considerable range. A quite simple method of controlling water fed to an economizer, as has been described, is to use a motor-driven centrifugal pump, possibly of the 2-stage type, and allow this pump to run continuously, the head under which it would operate being equivalent to 84 feet, which is ordinary service for a 2-stage pump.

Suction Branch from Storage Tank or Basin.

The line from a storage tank or basin is a rather unusual suction connection, being virtually a suction from some tank into which a pump discharges. This branch is quite necessary if there is but one source for obtaining water. The storage tank ordinarily would be used as a general low-service reservoir supplying water by gravity pressure. The pump would raise water to this tank, and if for any reason it be found necessary to shut off the regular pump-suction supply the tank water will be available for use as boiler feed or for any other water supply which must be maintained constantly. If there is another means of securing water it is quite unnecessary to make this connection unless there are two or more supplies which are insufficient for fire service, and water in storage is desired for this purpose. This would be the case if the plant had two wells of limited capacity. The only objection to such a system is the somewhat complicated arrangement of valves necessary to transfer the pump suction and discharge and the possible confusion which may be occasioned in handling such valves, more particularly in case of excitement at the time of an alarm of fire.

Figure 224-(F8-1 illustrates the connections to a large low-pressure water storage with a tell-tale for showing the relative water level. The well, a, as shown, usually is so limited in capacity that it is quite unfit for fire service, but by constant pumping ample water may be obtained at such times for the boilers and also to keep the water basin, b, well filled. For the storage of a large amount of water such a basin is practical only when at a low elevation, as otherwise the expense for building a high structure would be excessive. The line, c, is the fire main and is regularly used as a low-pressure service main. Whenever the water in the basin is low and the pump is not in use for boiler feeding or other high-pressure work, the valve, d, is open and the valve, e, closed; thus water is delivered to the basin through the pump discharge, f. The valve, g, is always closed and the valves, h and j, are always open except in case of fire. With such a system it would be necessary to number the valves which should be operated in numerical order in case of fire, thus avoiding any possibility of the two suctions, h and g, being open at the same time.

In regard to the proper handling of valves, pumps, etc., at the time of fire, it is becoming quite general practice to have regular fire drills which will accustom the men to their duties, so that in emergencies such errors as have been stated will not be made. In many installations the well, a, Figure 224, is a deep-driven one with a regular deep-well pump to raise the water. Under such conditions there should be no confusion at times of emergency as the deep-well pump would discharge to the storage basin, b, and the feed and fire pumps would take their suction from this storage supply.

Water Supply from Condenser to Heater.

There are four possible types of branches for supplying water from condensers to heaters. These may connect surface or jet condensers with open or closed heaters. In Figures 220 and 221 suction boxes are shown as a part of the jet-condenser discharges. If a closed heater is used its water supply may be taken directly from the pump box and the boiler-feed pump be used for this purpose if the lift is not too great. The steam temperature at 25 inches of vacuum is approximately 135 degrees F. If the water from the condenser has this temperature it will vaporize when the pressure is lowered to a point less than that at which it was condensed. A 25-foot lift would bring about conditions suitable for vaporization, but water at a temperature of 135 degrees and a lift of 25 feet are not met with in practice. The capacity of a condenser (condensing volume) is usually restricted, for commercial reasons, so that the common type of condenser requires its discharge water to be of considerably lower temperature than the steam under vacuum.

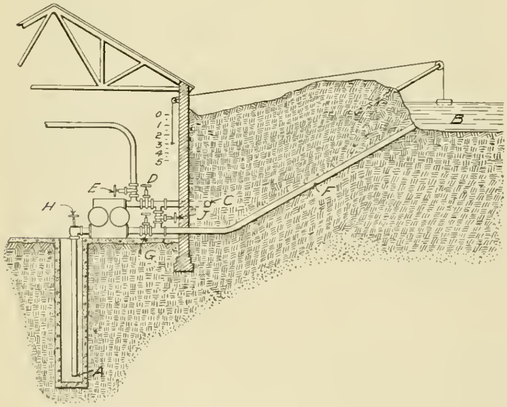


Figure 224—(F8-1).

Very few jet condensers will maintain a vacuum of 25 inches with the tail-water above 100 degrees F., and in most cases 90 degrees is considered high. In regard to the vaporizing of tail-water when the pressure has been reduced by the suction of the pump, it can be stated that it is possible to lift such water as many feet as there would be inches of vacuum and water at its highest possible temperature. This however, has not been found possible in practice because of other elements than vaporizing which must be considered. The most important obstacle is the gas liberated at heats as low as 90 degrees, this gas being thrown off from the organic matter found in the water.

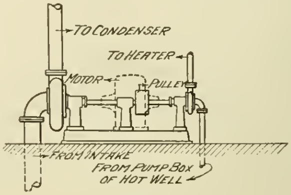


Figure 225—(G1-1).

The presence of such a gas is quite fully demonstrated by the action of a dry-vacuum air pump in which it is noted that a much higher rate of speed for removing a larger quantity of air is necessary in the summer season when the water contains much vegetation, than is required in the winter. The temperature of the tail-water is practically the same for both seasons, but its quantity is reduced during the winter. It has been further noted that during winter months the vacuum will not drop more than an inch below 25 inches when the air pump is out of service, but during the summer months the vacuum will drop four or five inches under similar conditions.

By arranging the hot-well as shown in Figure 220-(F4-1) the liberated gases will not be taken into the suction line and if the suction lift is not greater than 12 feet little or no trouble should be experienced by pumps losing their water due to gases accumulating in the pump cylinders. To further insure the successful operation of the feed pumps working under these conditions the size of the pump should carefully be considered in connection with the work which it is to do. The smaller the pump the greater the number of strokes and lesser liability of becoming "air-bound," or in other words, losing its suction.

If an open heater is used with a jet condenser it will be found necessary to install a hot-well pump for delivering water to the heater. This pump will be necessary on account of the usual conditions which determine the location of the hot-well at a low elevation and the heater at a much higher one. With an elevated jet condenser a very simple method of handling water to the heater is as shown in Figure 225-(G1-1). In this arrangement the same motor or belt drive that operates the injection-water pump is also used to operate the heater-supply pump. A float-operated valve such as is regularly furnished with open heaters, may be arranged to control the water fed to the heater, the centrifugal pump maintaining the same speed for varying requirements. The unit shown in Figure 225 is free from pump valves and reciprocating parts. It thus requires very little attention and the cost for maintenance is quite low.

If it is necessary to raise the hot-well water to the feed pump where a closed heater is used, this same arrangement as shown in Figure 225 may be used and the discharge from the small centrifugal pump piped direct into the feed-pump suction. A pump of the centrifugal type is the only one that can be operated successfully when discharging into the suction line of another pump. It is also the only type which can vary in capacity without having its speed altered.

There is the same opportunity for choice in the branches from a surface condenser to the heater as was stated for jet-condenser conditions. The surface condenser requires a pump to withdraw the condensation. This condensation is fed to the heater instead of the circulating water as with the jet condenser. If the pump is made amply heavy for duty in boiler feeding it can also serve both purposes as shown in Figure 226-(G1-2). This arrangement, of course, only applies to the use of closed heaters as shown in the illustration. The feed pump in this case would be controlled by the amount of condensation in the pocket, a, the float in this pocket operating the valve of the pump.

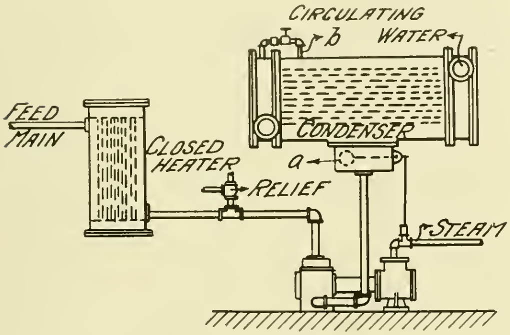


Figure 226—(G1-2).

With the arrangement as shown it would be necessary to have one or more feed valves open at all times to avoid the loss of condensed water. In fact, this is necessary in any piping system using a surface condenser. Such steam as condenses in other parts of the system outside of the condenser itself must be replaced by water added to the condensation. This is an almost invariable quantity and the loss can be provided for by leaving the by-pass, b, open wide enough to allow a sufficient amount of circulating water to be admitted into the vacuum chamber of the heater and from there pass with the condensation to the pump.

The relief valve shown in the illustration should be so located that if it discharges a boiler-room operator can readily notice it and open a feed valve, thus avoiding any waste of condensation. If the feed valves are properly handled this relief valve should never discharge. Hand-operated feed valves will be found much more satisfactory with this piping system than any automatic feeding devices. With the hand-operated valve it is possible to save the water of condensation at all times, and but little regulation should be required as the float will control the speed of the pump according to the amount of condensation in the pocket at the bottom of the condenser.

The pump may be located out of reach of the fireman. The by-pass, b, should be quite small and of a size which will supply steam to the system to make up for that which is fed to the auxiliaries. This make-up will not ordinarily exceed 10 per cent of the total amount of water fed the boilers. The by-pass would, therefore, be about two inches in diameter for a plant having 5,000 horsepower boiler capacity. It may be found convenient to run the by-pass piping to a point in the boiler-room where a handwheel can be placed so that it can be operated by the fireman.

The pump used for this service would not be subjected to the pounding strains common to the so-called air pump, which removes both air and water from the condenser. A separate dry-vacuum air pump would be required with the system as shown. Such a pump is necessary for perfect operation. The feed pump would be called upon to handle nothing but solid water, but in order to assure this it is necessary to place the pump a sufficient distance below the water line in the bowl, a, to make certain that the water will pass to the cylinder without lowering the pressure therein.

If an open heater is used the condensation pump may be of a lighter design and arranged to discharge the condensation into the heater without any restricting device operated by the water level in the heater. Such a pump may handle air and water together and discharge both into the open heater. This arrangement, however, requires a separate pump for boiler feeding. It is practical to run the auxiliaries condensing not using a heater and thus have little or no water passing through the by-pass, b. Such practise, however, is far from economical. A steam pump will not use more than 50 British thermal units per pound of steam delivered to it if the remainder, in exhaust, is delivered to the feed water, but an engine will require the expenditure of 1,100 British thermal units per pound of steam delivered to it. In other words, the pump can use 22 times as much steam per horsepower as the engine and yet be as economical if all the heat of the exhaust is taken up by the feed water. It will thus be noted that no engine is operative with a sufficiently small number of pounds of steam per horsepower, nor is any steam pump sufficiently wasteful of steam to warrant running a feed pump condensing, even though it is possible to reduce the steam consumption of a feed pump to that of the most economical steam unit known.

Another method of delivering water to a heater by means of a suction pump from a low-down type of jet condenser is by elevating the discharge to such a height that the water will flow into the open heater by gravity as shown in Figure 227-(G1-3). When considering such a connection it should be remembered that for every foot the discharge is raised, as shown by the dimension line, a, this lift is equivalent to raising the feed water 30 times this amount as the quantity thus lifted is ordinarily about 30 times that fed to the boiler. The only advantage in this style of connection is the elimination of one pump.

If a house pump is used to supply the cold water it may be found better practice to utilize this same pump for supplying water to the heater rather than by increasing the duty on the air pump by raising the head.

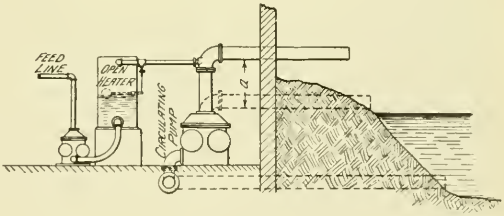


Figure 227—(G1-3).

To make a comparison of the relative economy of the two practices it may be assumed that a, in Figure 227, is 5 feet, that the condenser uses 30 pounds of water per pound of steam condensed, that the temperature of the intake water is 55 degrees and the discharge water 90 degrees and that the pump dequires 100 pounds of steam per horsepower. Then for each pound of feed water there will be required the following additional British thermal units necessary to raise the water 5 feet: B. t. u. = (30 lb. x 5 ft. x 100 lb. steam per h. p. x 50 B. t. u. per lb. steam) ÷ 33,000 = 23. If cold water is used 1-30 of the result just obtained will be required for pumping, thus ¾ B. t. u. plus the difference between the heat units and water of 90 degrees, or 58 B. t. u., and water of 55 degrees, or 18 B. t. u., which is 35 B. t. u. equals a total of 35.75 B. t. u. It will thus be noted that the cost will be less to raise the entire condensing water more than 5 feet (about 7 feet 6 inches being the balance) than to use cold injection water. If more steam is being delivered to the heater than can be condensed and heat units are thus being wasted, the cost of raising this water will be increased 22 times. This is equivalent to the difference of elevation, a, being about 3 inches if all the steam from the condenser is wasted.

Under ordinary circumstances the details shown in Figure 227 should be avoided, as this arrangement fails to provide means for supplying water to the heater when the condenser is not in operation, and also causes the air pump to work unsatisfactorily due to the higher column against which it must work.

Water Supply to Heater from Intake.

It is generally found necessary to make a connection for general service purposes from the intake line to the pump suction, two pumps being used for this service. With such details no further provision is necessary to supply the heater from the intake. However, a connection for supplying the heater from the intake is absolutely necessary and if but one pump is used it should have connections to both the hot-well and the intake. The condensation pump shown in Figure 228-(G 2-1) should have a suction line from the intake that can be used to supply either the closed or open heater if the condenser is out of service. This figure shows the intake with suctions to the condenser and the feed pumps. The feed pump No. 1 ordinarily would be used for feeding the boilers and No. 2 would be the general service pump. In regular operation condensation pump No. 3 would take the condensation from the condenser and deliver it to the top of the heater, while pump No. 1 would take its suction from the heater and No. 2 from the intake. If the condenser should be out of service then the suction for pump No. 3 would be from the intake and not from the condenser. If the heater were out of service the condensation would be delivered direct to the suction of pump No. 1, using the small well, a, which would be open to atmosphere and have a connection to the condenser discharge. If the feed pump were pumping more or less water than that delivered to pump No. 3, then water would flow either to or from the well in pipe, b. If the length of the line, b, is short the well, a, may be dispensed with by connecting the lines, a, b, and c, and by having the line, b, with its connection below the water level it will then be possible to operate with the intake shut down. To insure continuous operation these different connections as stated are quite necessary.

Heater Water Supply from City Main.

Such boiler installations as are dependent upon city water for their feed are of necessity non-condensing plants. These conditions suggest that the heater used should be of the open type, thus reducing the cost of water below that for the closed type. Such being the case, the open heater can be fed direct from the city line using the float control as regularly supplied with heaters. If the plant is ordinarily supplied with water other than that from city mains and yet the city water is available, it will be found advisable to have the city connection to the heater supply line which can be used when necessary.

To provide this connection without running a special line some plants use a hose valve at the heater inlet and whenever it is necessary to use city water the fire hose is connected from this valve to some convenient point in the fire or other systems using city water and the heater thus temporarily supplied through the hose. This may seem to be a rather crude arrangement, but it has the advantage that the operator must go to some trouble to make the hose connections, and whenever he is using city water the fact is conspicuously evident. On the other hand, if an operator knows that he can get city water by simply opening a valve it is not likely that he will be as careful in keeping his own water supply in good working order. If wastefulness is made easy in a boiler plant this fact will invariably be taken advantage of, and for this reason many conveniences and precautionary devices have been removed in such plants for the purpose of avoiding their abuse by the employes.

(To be continued.)

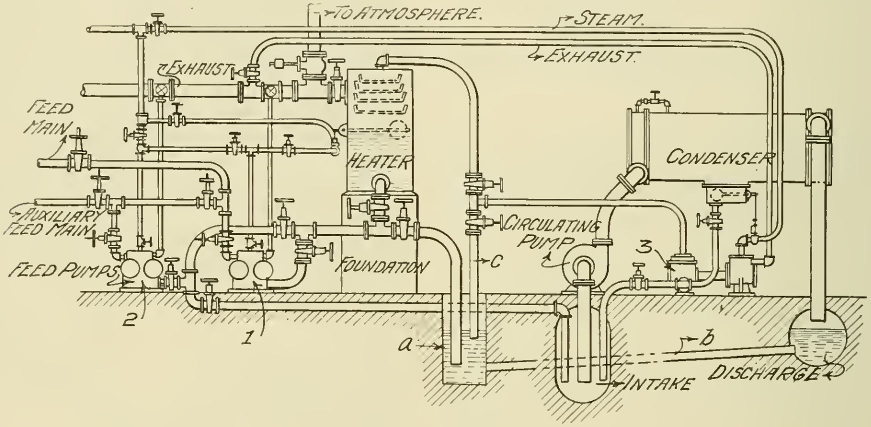


Figure 228—(G2-1).

The Annual Consumption of Ties.

The Forest Service has issued a report based upon statements from 770 steam railway companies showing that the total number of ties purchased during 1905 was 77,981,227, the switch ties being reduced to an equivalent number of cross ties. The roads reporting are said to include all but about 9,000 miles cut of the total mileage in the United States. Of the total number of ties purchased 14,459,521 or about 18.5 per cent were for use in the construction of new track. In assuming additional ties for the unreported track and estimating the ties for electric lines at 10,000,000, the total number of ties purchased last year in the United States was about 91,500,000.

RECENT ELECTRIC RAILWAY LEGAL DECISIONS.

BY J. L. ROSENBERGER, LLB. OF THE CHICAGO BAR.

Duty of Operators of Street Cars at Railroad Crossings.

Renders v. Grand Trunk Railroad Co. and others (Mich.), 108 N. W. Rep. 368. July 3, 1906.

The law for the protection of the public, the supreme court of Michigan says, imposes a duty upon the operators of a street car, in crossing a railroad track, to stop the car and go ahead to ascertain by looking and listening if the way is clear.

Lessee of Street Railway which Assigns its Lease and Sells its Cars is Not Liable for Negligence in Operation of Road.

Dunn v. Asheville & Craggy Mountain Railway Co. (N. C.), 54 So. Rep. 416. May 22, 1906.

The doctrine has obtained in North Carolina that a railroad company, owning its road under and by virtue of a state charter, cannot escape responsibility for negligence in the operation of its road by leasing it to another company, unless its charter or some subsequent act of the legislature expressly exempts the lessor road from such responsibility. But the supreme court of North Carolina says that in no case, so far as it is aware, has it been declared or intimated that a lessee, who has assigned all his interest and who is not, in any way, engaged at the time in the management or operation of the road, can be held for his assignee's misconduct. And it holds that where such an assignee of a lessee simply had in possession and was using some of the personal property which the lessee had formerly owned and had assigned, to wit, the cars and the lease, the lessee was not liable for injuries caused by the negligence of employes of said assignee.

Effect of Rules Prohibiting Riding on Front Platform or Declaring it to be at Passenger's Risk—May Prove Rule by Passenger—Knowledge Enough—Permitting Passengers to Ride on Front Platform Waives First Rule But Not the Second.

McDonough v. Boston Elevated Railway Co. (Mass.), 78 N. E. Rep. 141. May 17, 1906.

It has been settled, the supreme judicial court of Massachusetts says, that where a common carrier of passengers operating a railway by whatever motive power establishes a rule either prohibiting passengers riding on the front platform, or stating that if passengers while in transit choose to ride on the front platform they do so at their own risk, a passenger who with knowledge of the first rule intentionally violates it, or of the second rule chooses to take the risk, being thereby injured, cannot recover therefor.

Such a regulation as a general rule of the second class may be proved from the testimony of the passenger himself. And if from previous observation such warning and consequent assumption of liability were known to the passenger, it is unnecessary for the company to go further, and prove that he also had seen the notice on the particular car where he was riding when injured, for such knowledge, followed by his choice of position, would operate to bar his recovery of damages.

In permitting its cars to be regularly operated by inviting passengers to ride on the front platform, even if open for their accommodation, the company is not acting inconsistently with its right to insist on the second rule, the choice of riding there or inside the car being still left optional. The distinction between prohibiting such use of the platform, and then waiving the prohibition by regularly opening it for the accommodation of passengers, or permitting them to ride there at their own risk is obvious. In the first instance the restriction is absolute until abandoned, and the abandonment may be implied from the conduct of the carrier; while in the last the platform is left unreservedly open, yet the opportunity of carriage thus afforded is furnished only upon condition that the passenger occupying this part of the car takes the chance of injury that may be caused by reason of the exposed position.

Passenger Stepping Off Car to Prevent Unlawful Battery by Conductor or to Pick up Hat or to Take a Drink of Water.

Zeccardi v. Yonkers Railroad Co. (N. Y. Sup.), 99 N. Y. Supp. 936. June 15, 1906.

There being evidence from which it might be found that the conductor committed an unjustifiable battery on the plaintiff's companion on the car and then dragged him off the car with the aid of the motorman, and continued the battery on him, and that, on the plaintiff getting off the car and going toward them, to separate them, the motorman committed a battery on him to prevent him, the second appellate division of the supreme court of New York says that the fact that the battery was committed on the plaintiff after he got off the car by no means prevented him from recovering against the company. He had not, as matter of law, ceased to be a passenger. Any passenger may lawfully interpose to prevent another passenger from being unlawfully battered by the conductor, either on the car or after the conductor has dragged him off the car. By stepping off the car to stop the battery he no more ceases to be a passenger than if he stepped off to pick up his hat or take a drink of water.

Company Not Liable for Standing Passenger Being Forcibly Thrown from Car by Another Passenger Against Whom the Conductor Pushed Him.

Snyder v. Colorado Springs & Cripple Creek District Railway Co. (Colo.), 85 Pac. Rep. 686. Mar. 5, 1906. Rehearing denied Apr. 2, 1906.

The plaintiff, having paid his fare, was standing near the door of the car, which was crowded, with his hand resting on the door jamb, when the conductor, in pushing his way through the crowd, pressed him against a party who was sitting in a seat on the side of the car. This man became angry, said that he was "getting tired of playing cushion for the electric line," and raised up against the plaintiff and gave a "surge" by the force of which the plaintiff was thrown from the car, passing over the head of a man who stood upon the lower step. The supreme court of Colorado holds that the company was not responsible for the consequences of the passenger's act.

There was nothing, the court says, to show that such a consequence as happened was liable to occur. It was of course possible that some extremely nervous or irritable person would become angry because of his being inconvenienced on account of the crowded condition of the car; but it was not in accordance with the usual and ordinary course of events to anticipate that a seated passenger would so far lose control of himself on account of having a standing passenger crowded against him that he would eject the standing passenger from the car with such force as to throw him over the head of one who was standing upon the step below the party so ejected. It was apparent from the record in this case that the proximate cause of the injury to the plaintiff was the action of the irritated passenger, and that this cause could not be anticipated by the defendant or its agents.

With regard to the plaintiff's contention that this question should have been submitted to the jury, the court says that this course would have been necessary if material facts had been in dispute, but where, upon all the evidence, the court is able to see that the resulting injury was not proximate, but remote, the plaintiff fails to make out his case, and the court should so rule. If the matter had been submitted to the jury and the verdict had been rendered in favor of the plaintiff, it would have been the duty of the court to set it aside. Consequently, it was his duty to direct the verdict.

FRANCHISES SUBJECT TO FRANCHISE TAX IN NATURE OF LICENSE TAX EXEMPT FROM PROPERTY TAX UNDER STATUTE.

North Jersey Street Railway Co. v. Mayor, etc., of Jersey City (N. J. Sup.), 63 Atl. Rep. 833. June 11, 1906.

The question involved here was as to the right of the city to levy a property tax upon the right, privilege, license, or franchise of the prosecutors to lay and maintain street railway tracks and operate trolley cars thereon. The New Jersey act of 1903 provides for the taxation of all property, real and personal, not expressly exempted by the act, or excluded from its operation. Included in the property exempted from taxation are "all officers [offices] and franchises, and all property used for railroad and canal purposes, the taxation of which is provided for by any other law of this state." The supreme court of New Jersey holds that the last clause qualifies franchises as well as property used for railroad and canal purposes, and that the exemption is only of franchises the taxation of which is provided for by another law. It is settled in New Jersey that franchises are property. And the franchise sought to be taxed by the city in this case, being subject to a franchise tax in the nature of a license tax under the act of 1900, the court holds was not subject to a property tax under the general act of 1903. It was for the legislature to determine whether the tax imposed by the act of 1900 was a fair apportionment of the public burden without subjecting the prosecutors to a property tax upon the value of the franchise in addition. As a license tax, it was not subject to the constitutional requirement that property shall be assessed according to its true value.

OPERATION OF ROAD NOT REQUIRED BY STATUTE OF PURCHASER AT RECEIVER'S SALE—SUPERINTENDENT OF STREETS CANNOT REFUSE LICENSE TO TAKE UP RAILS FROM DESIRE TO HAVE ROAD OPERATED—MAY BE COMPELLED BY MANDAMUS TO ACT ON APPLICATION.

French v. Jones (Mass.), 78 N. E. Rep. 118. May 16, 1906.

Section 12 of chapter 112 of the revised laws of Massachusetts provides that a receiver of the property of a street railway company may, by order of the court, sell and transfer the road and property of such company, its locations and franchises, etc. Section 13 provides that the purchasers at such a sale shall within 60 days thereafter organize a corporation for the purpose of holding, owning and operating the street railway purchased, and that if they fail to organize such a corporation in the manner therein prescribed, all rights and powers to operate the road shall thereupon cease.

It may be granted, the supreme judicial court of Massachusetts says, that these sections of the statute contemplate the continued operation of a street railway which has been sold under the authority that they give. But no such requirement is made in terms; and the provision in section 13 that upon failure to form a corporation to hold and operate the railway the right and power to operate it shall cease, is far from being tantamount to a provision that the purchasers shall suffer the further penalty of being deprived of the property which they have bought and paid for. The receivers have full power to make the sale; it is their duty to do so when ordered by the court which has appointed them; they have no right or duty to inquire into and no means of ascertaining the motives or intentions of bidders or purchasers.

But the right of a purchaser to remove the rails and other materials which are imbedded in the surface of the public street, and for that purpose to break and dig up the street, depends upon other considerations. Under a city ordinance, the purchaser in the case before the court could not, without a license granted by the superintendent of streets, break or dig up any part of the way, and so could not remove the rails. That official refused to issue the license asked for merely from a desire to keep the rails in the streets in the hope that some person or corporation would operate street cars over them. The court is of the opinion that the purchaser was entitled to have a writ of mandamus issue, commanding the superintendent of streets to hear and determine his application for a license to take up the rails without regard to any hope or desire that some person or corporation would operate cars over the tracks, but exercising his sound discretion as an officer charged with the care of the streets, in view of the fact that the purchaser was the owner of the property in question and was not under any duty to use it for the operation of street cars.

RIGHTS OF PASSENGER GIVEN WRONG TRANSFER—FAILURE TO MAKE EXPLANATION BEFORE BEING PUT OFF CAR—DAMAGES RECOVERABLE.

Cleveland City Railway Co. v. Conner (Ohio), 78 N. E. Rep. 376. May 22, 1906.

A passenger on a street railway, who has paid fare and is entitled to ride over another line belonging to the same company, and who, having asked for a transfer ticket over such other line, is given, by mistake of the conductor, a transfer which is not good over such other line, the supreme court of Ohio holds, may, nevertheless, if he has exercised such care about the receiving and making use of the transfer ticket as persons of ordinary prudence are accustomed to exercise under the same or similar circumstances, lawfully insist upon being carried over such other line without further payment of fare; and if such passenger, without fault on his part, is ejected from a car for refusing to pay fare other than by such transfer ticket, he may recover damages for the tort, and cannot be restricted to damages for breach of the contract to carry him. A failure of the passenger to make a statement or explanation before being put off the car will not of itself defeat his right to recover damages; but such fact is admissible in evidence as bearing upon the question of his good faith in accepting and using the erroneous transfer, and as affecting the amount of damages.

REASONABLENESS OF RULE REQUIRING COLLECTION OF FARE FROM EVERY ONE PASSING THROUGH TURNSTILE, EVEN WHERE ONE WENT BACK TO LOOK FOR LOST PAPER—NO DISCRETION IN EMPLOYE AS TO ENFORCEMENT OF SUCH RULE.

Sickels v. Brooklyn Heights Railroad Co. (N. Y. Sup.), 99 N. Y. Supp. 953. June 15, 1906.

The plaintiff, after paying his fare and passing through the turnstile at an elevated station, discovered that he had lost a paper, and informed the defendant's servant of his desire to go back and find it, but was told that if he did so he would have to pay another fare to be admitted to the station platform. He found the paper on the stairs leading to the street, and, upon returning, demanded that he be allowed to go upon the station platform without the payment of another fare, which was denied him. For this refusal and the indignity to which he claimed to have been subjected he recovered judgment. This, however, the second appellate division of the supreme court of New York reverses. It says that the plaintiff did not question the reasonableness of the rule relied upon by the defendant, that no one should be allowed to pass the ticket window unless a fare was paid, and in view of the number of persons daily entering these stations, such a rule was both reasonable and necessary. But the plaintiff claimed that, as the defendant's servants knew that the plaintiff had paid a fare for which he had had no ride, it was unreasonable to enforce the rule. No case was cited to sustain the proposition that, the rule being reasonable, the servant nevertheless has a discretion respecting its enforcement. The court places its decision upon the ground that the defendant's servant had no discretion respecting the enforcement of the rule requiring the payment of another fare before the plaintiff could be readmitted to the station platform. If the plaintiff desired to test the question whether he had received any consideration for the fare already paid, he should have done so in an action to recover it.

LAW REQUIRING DIVISION OF CARS FOR RACES DOES NOT DEAL WITH PLATFORMS—USE OF "SIGNS" NOT COMPLIANCE WITH LAW—LIABILITY FOR ARREST AND EJECTION OF PASSENGER FOR REFUSING TO OBEY LAW NOT COMPLIED WITH.

Waldauer v. Vicksburg Railway & Light Co. (Miss.), 40 So. Rep. 751. May 7, 1906.

In an action for damages for an alleged wrongful arrest and ejection from a car for an averred violation of the "Jim Crow" law, the supreme court of Mississippi holds that it was error to take the case from the jury. The plaintiff, it appeared, had insisted on standing on the rear platform of an open car, while the conductor demanded that he go inside to the front part of the car set apart for white passengers. But the law (chapter 99 of the Acts of Mississippi of 1904), the court says, does not deal with platforms at all. It deals with the cars in which passengers generally ride. Its provisions are confined in their operation to "cars and apartments," and require the divisions of cars into compartments for the accommodation and separation of the races.

In order to justify a street car company in directing the arrest of a passenger for a violation of this law, the court goes on to say, it must be manifest that the company has itself faithfully carried its provisions into effect. The law was enacted in pursuance of a wise public policy, and its mandate is obligatory on all street car companies. But in this case it did not appear that the company had complied with its requirements. It had resorted to the subterfuge of putting up "signs," instead of providing screens or partitions, as required by the express terms and manifest intent of the statute. This court again condemns as unavailing this attempt to evade the law.

The company must first comply with the law before its protection can be invoked to avoid liability for an otherwise tortious act. If the company, while itself willfully violating or ignoring the law, still attempts to punish a passenger for refusing to obey the same law, and wrongfully ejects him from the car because of such refusal, the wronged passenger would be entitled to such damages as the jury, under the circumstances attendant upon the expulsion and arrest, might feel justified in awarding.

SUFFICIENT EVIDENCE THAT COMPANY DUG HOLE FOR TROLLEY POLE—DUTY TO PASSENGERS HAVING TO GO FROM ONE CAR TO ANOTHER—FAILURE TO SEE THAT WAY IS REASONABLY SAFE BEFORE NIGHT—COMPANY CHARGED WITH NOTICE OF DEFECTIVE CONDITION.

Colorado Springs & Cripple Creek District Railway Co. v. Petit (Colo.), 86 Pac. Rep. 121. June 4, 1906.

A passenger required to walk from one car to another while a section of the road about 250 feet in length was being repaired was injured by stepping into an open hole made for a trolley pole. It was argued that there was an absence of proof that the company was negligent, in this; there was no evidence that the company dug the hole or that it had existed a sufficient time to charge the company with notice of its presence. But the supreme court of Colorado says that there was evidence that the company's railway was electric. There was evidence that the hole was close to its track, and dug for a trolley pole. The court thinks such evidence, in the absence of explanation, justified the conclusion that the company dug the hole.

Further, the court says, the accident was about two in the morning. The hole must have been dug not later than the preceding day, and was uncovered when the accident occurred. The company knew that the way would be traveled by its passengers in the darkness of the following night. It was guilty of negligence in not using reasonable care to see that the way was reasonably safe before the night came on. If it had exercised such care, it would have discovered the presence of the hole and would have rendered it safe. The company, therefore, was charged with notice of the defective condition of the way.

Further, the relation of carrier and passenger existed between this party and the company when he was passing from one car to the other, and it was the duty of the company to use reasonable care to have the way over which he was to pass in a reasonably safe condition. As the relation of carrier and passenger existed while he was passing over this way and as the way was in an unsafe condition, and from such condition the accident resulted, a prima facie case of negligence was made out against the company, and the burden was then upon it to show the absence of negligence in the unsafe condition of the way.

RIGHT UNDER STATUTE OF ONE ELECTRIC RAILWAY TO CROSS ANOTHER—WHAT CONSTITUTES FAILURE TO AGREE ENTITLING TO APPOINTMENT OF COMMISSIONERS—OFFERS OF OR CONTRACTS WITH OLD COMPANY IMMATERIAL—DUTY TO PUBLIC.

In re Eastern Wisconsin Railway & Light Co. (Wis.), 107 N. W. Rep. 496. Mar. 20, 1906.

Subdivision 6 of section 1828 of the revised statutes of Wisconsin of 1898, respecting railroad crossings, provides that railroad corporations shall have power "to cross, intersect, join and unite its railroad with any railroad heretofore or hereafter constructed, at any point on its route and upon the grounds of such railroad corporation. * * * And every corporation whose railroad is or shall be hereafter intersected by any new railroad shall unite with the owners of such new railroad in forming such intersections and connections and grant the facilities aforesaid; and if the two corporations cannot agree upon the amount of compensation to be made therefor or the points and manner of such crossings and connections the same shall be ascertained by commissioners to be appointed by the court, as is provided in this chapter in respect to acquiring title to real estate." Chapter 497 of the laws of Wisconsin of 1905 makes all the provisions of the above subdivision apply to street and electric railways, and provides in effect that the commissioners shall have power to determine the place at, and manner in, which grade or other crossings shall be made, etc.

It will be seen from the foregoing, the supreme court of Wisconsin says, that no specific act is enjoined by the terms of the statute upon the company seeking to cross. Clearly, from the express language of the statute, no specific duty is imposed upon the company seeking the crossing respecting an effort to agree other than is imposed upon the old company. No act is required to be done, and no positive duty in that regard enjoined. The duty imposed must rest alike upon both parties. The failure to agree is all that it is necessary to allege in the petition for the appointment of commissioners, etc. In this case, when the demand was made to agree and pay just compensation, it was the duty of the old company to meet the petitioner upon its proposition, and endeavor in good faith to agree. The written proposition of the petitioner, and the lapse of nearly a month without any response from the old company, was sufficient to justify a finding that the parties were unable to agree.

Again, the court says that the record in this case showed that the petitioner could not enter the city (of Oshkosh) over its proposed route without crossing the tracks of what has been called above the old company. The offer to permit the petitioner to use certain portions of its track in entering the city, or certain alleged contract relations, need not be considered, since they were no defense to this proceeding. The petitioner was entitled to the appointment of commissioners to determine the question of a crossing on the route proposed, under the provisions of the statute, and whether some other crossing, track or means of entrance was offered by the old company, whether available or not, was wholly immaterial. The petitioner had the right to construct and operate its road under its franchises in the manner provided by law over the route selected by its board of directors, and it owed a duty to the public to do so, which it could not abandon at pleasure.

SUGGESTION AS TO LEGALITY OF RULE RESTRICTING TRANSFERS FROM THROUGH CARS ON CROSS-STREETS AND PROVIDING FOR DIFFERENT COLORED TICKETS—EFFORT MUST BE MADE TO NOTIFY PUBLIC OF INSTITUTION OF RULES—GIVING DIFFERENT TRANSFER FROM ONE ASKED FOR—STRICT PROOF OF VIOLATION OF STATUTE REQUIRED.

Gasper v. New York City Railway Co. (N. Y. Sup.), 99 N. Y. Supp. 902. June 28, 1906.

This was an action to recover a penalty for refusal to transfer a passenger. The litigation, however, was occasioned, not because of an absolute ignoring of the law on the part of the company, but rather through an attempt by it to establish, in observance of the statute, a so-called "reasonable regulation," made for the convenience of the public. This included the use of different colored transfer tickets. The plaintiff on a north-bound car going westward on a cross-street asked the conductor for a transfer to take her south. The conductor handed her a transfer, which the conductor on the south-bound car which she boarded refused to accept. The company explained that it had established a rule or regulation calling for the issuance on cars on said cross-street of transfers in different colors, so that a passenger riding west along said cross-street could secure by boarding a cross-town car a white transfer ticket, which would enable him or her to ride on said transfer either north or south. On boarding a car that had come north on a certain other street and was continuing west along the cross-street to ultimately resume its northern trip along another street, a green ticket would issue, which would permit the passenger on said transfer to go or continue in a northerly direction only. The plaintiff had taken one of these latter cars, issuing the green transfer tickets only, whereby, the company maintained, she had lost her right to be transferred in a southerly direction.

This rule, the company insisted, was a reasonable one, and was adopted as a regulation in giving of transfers for public convenience, as also by its use to protect the company from the imposition of passengers riding all day up and down and across the city for one fare. And the appellate term of the supreme court of New York says that it recognizes the force of this contention, and can readily see from the immensity of traffic in that city and intricate details involved in catering to same that a regulation or rule of some such kind must ultimately be evolved and meet with judicial approbation. But the difficulty with the case at bar which prevented the court from passing upon such a condition was that, while it had some evidence of the institution of such a rule by the company, the record was wholly destitute of proof of any notice to the public of the inauguration of such provisions; and to make a regulation of such a kind (which, of itself, may well be determined a reasonable and necessary one) of any force whatever, there must be attendant proof of reasonable endeavor and effort by notice to apprise the public of its institution. Of course, the court had observed that there was no actual refusal to transfer, but what was done in handing the passenger a worthless piece of paper, as this north-bound transfer was, in so far as the accomplishment of the passenger's intention expressed to the conductor of a desire to go south was concerned, must be taken as tantamount to a refusal, and the court believes, therefore, that the judgment in her favor should be affirmed, with costs.

The fact that the request of the passenger was clearly made for a transfer "south" is emphasized as of decisive importance in another case entitled exactly the same, but with a different Gasper as plaintiff (99 N. Y. Supp. 904). In this latter case the proof was that the plaintiff asked for a transfer to Amsterdam avenue, and received the same, and the court reverses a judgment in her favor, ordering a new trial, for the reason that, as the action was for the recovery of a penalty based upon the refusal to obey the mandate of a statute, it feels that judgment should be sustained only upon strict proof of the violation thereof, and upon this record it does not believe the necessary refusal was established.

INTERURBAN AND LOCAL SYSTEMS OWNED BY ONE COMPANY GIVING TRANSFERS ARE ASSESSABLE AS AN INTERURBAN RAILWAY—SEPARATION IN BOOKKEEPING OR WHICH WAS FIRST CONSTRUCTED IMMATERIAL—CURTAILING OR ENLARGING USE OF CARS OVER STREETS.

Waterloo & Cedar Falls Rapid Transit Co. v. Board of Supervisors of Blackhawk County (Ia.), 108 N. W. Rep. 316. July 11, 1906.

A company having acquired the street railway systems in two cities and connected the cities with an interurban line, seeking to keep its interurban system separate and independent from its local systems, traversing by its interurban cars but 1,944 feet of its local system in one of the cities, and but 2,995 feet of that in the other, while in the two cities it operates 50,239 feet, or about 9½ miles of street railway which are not touched or traversed by its interurban cars, though it gives transfers and operates all its lines practically as one property, save in the matter of bookkeeping, the supreme court of Iowa holds that, under the statutes of that state, the whole system should be assessed for taxation as an interurban railway.

The real basis of the argument against this, the court says, was that the nature of the property should be determined with reference to its use, and not with reference to its ownership; but this was manifestly unsound. In the broadest sense ownership must to a large extent determine the character of the assessment. Of course, the nature of the property does not depend primarily upon its ownership; but the character of the assessment to be levied against it may be determined thereby. The company might, of course, own a street railway, and an interurban one independent thereof, and having no connection therewith; but when the two are combined into one system, the character thereof may be defined by the legislature for the purposes of taxation, and this is what the court thinks the legislature intended to do. The fact that in keeping its books the company separates the two is of no consequence. It is not important, either, as to which line or system was first constructed.

If an interurban company comes into a city under a lease with a street railway company for the use of the tracks of the latter, it, of course, does not own the property, and could neither be assessed therefor, nor would its act convert the street railway company into an interurban one. All depends upon the ownership of the two systems. If separate, there are no difficulties, for each is assessed for its own. If by the same company, the entire property should be assessed as one or the other; that is to say, either as a street railway, or as an interurban one. It is not for the corporation or company, by a system of bookkeeping, to determine what part of its line shall be street railway, and what part interurban. Moreover, no company should be allowed to change the character of its property from time to time either by curtailing or enlarging the use of its cars over the streets of a city.

NEWS SECTION

GENERAL NEWS OF THE MONTH

June Conventions of 1907.

At a meeting of the joint executive committee representing the Master Mechanics', the Master Car Builders' and the Railway Supplymen's associations held at the Manhattan Hotel, New York, on Monday, October 29, it was decided by unanimous vote to hold tho mechanical conventions of 1907 at Atlantic City. Tho Master Mechanics will assemble on Wednesday, June 12, and the master car builders on the following Monday, the sessions concluding on Wednesday, June 19.

Western Railway Club.

The regular meeting of the Western Railway Club was held at the Auditorium Hotel, Chicago, on Tuesday evening, October 16. The principal business of the meeting was the reading of a paper by Mr. E. W. Farnham on "Electric Power versus Steam Power" in the operation of railroads especially as applied to heavy traffic lines, passenger and freight, suburban and interurban lines and large terminals. The paper was illustrated by the stereopticon and included quite a number of very good views of electric railway equipment and conductors.

The comparison of steam and electric power for railroads was rather brief, dealing principally with the objection to dead weight on steam locomotives as compared with the lighter electrical locomotive and the motor car and the greater efficiency of the latter. The paper was principally concerned, however, with electric conductors for heavy trains and especially the protected third rail. The author is the inventor of a protected third rail and he illustrated various designs which accompanied the development of his system. His objections to the trolley were pointed out in detail and the advantages of the third rail were elaborated.

In the discussion of the paper Mr. Clement Street of the Westinghouse Electric Company spoke at length on the general subject of the application of electricity to service on steam lines and took the opposite side of the question by favoring the trolley wire and opposing the third rail. Other speakers pointed out the fact that some lines using the third rail did not find it necessary to protect it and a prominent case is that of the Aurora Elgin & Chicago electric line, which has used an unprotected third rail about four years. This road is operating a fast and heavy service and has never had an accident except that due to an intoxicated tramp.

Serious Accident on the West Jersey & Seashore.

On Sunday, October 28, a three-car train, operated by multiple unit control, on the West Jersey & Seashore, the steam road between Camden and Atlantic City which the Pennsylvania recently equipped for electric operation, left the rails at a new drawbridge over the Thoroughfare, an arm of the ocean separating Atlantic City and the mainland. The motor car left the track, dragging the other cars after it. The train plunged along over the frame work of the bridge for a distance of from 50 to 60 yards, at which point the first car loaded with passengers left the structure and disappeared into the water. It was quickly followed by the second coach, also filled with passengers. The third car fell part way into the water, but the rear trucks caught in the abutment of the bridge, holding part of the car clear. The train left Camden at 1 o'clock p. m. and was understood to have carried about 100 passengers, of which 14 left the train at Pleasantville. Although the exact number of passengers on the train was not known it was estimated from the conductor's report and from this the number of lives lost has been calculated to be over 64. The work of recovering the bodies, raising the cars and ascertaining the cause of the disaster has been in the personal charge of Mr. W. W. Atterbury, general manager of the Pennsylvania. The last car of the train was easily raised from its position by means of a wrecking derrick, but no bodies were left in the car. Most of the passengers in this car escaped and the bodies of those who met death in the front end of the car were early recovered. The bodies of the other victims were recovered by divers and attempts were made to raise the cars from the bed of the stream, but, although two derricks were used, the two forward cars have not at this writing been permanently raised. It was thought that the use of dynamite was necessary, but this plan was objected to by local officials. The coroner's investigation placed the blame for the accident on the bridgetender. The wheels appear to have struck one of the bridge rails, either indicating that the bridge, which shortly previous to the accident had been opened to allow a vessel to pass, did not completely lock in a normal position, or that the bridge rail was deflected as a result of some other defect. The first section of the rail was wrenched from its fastening and displaced and was found to be battered. It was thought that an examination of the wheels would show that the accident resulted from a broken flange or that the truck would show some serious defect. The trucks of the submerged coaches were raised, but appeared to be in perfect condition. As a result of the investigation the Pennsylvania Railroad has issued the following statement:

"After thorough investigation the Pennsylvania Railroad officials have found no explanation of the accident on the Thoroughfare bridge Sunday. All possible theories advanced were traced to the bottom, but the cause of the derailment of the electric train is no better known than it was at first.

"It was hoped that the trucks of the cars, when raised out of the water, would afford some clew, but they did not. They were carefully examined by officials of the company, including General Manager Atterbury, Chief Electrical Engineer Gibbs, General Superintendent of Motive Power Gibbs and others. The trucks were intact, and there was nothing about either the wheels or the other parts to throw any light on the matter.

"Thorough examination of the bridge and the mechanism used in moving the draw showed that these were in perfect shape. All evidence shows that the rails were exactly in place. Aside from the fact that the interlocking signal could not have shown a clear track otherwise, the bridge tender is positive that the rails on the draw and those on the stationary part of the bridge fitted precisely.

"When the train approached he was standing within three or four feet of the point where the rails joined, and he looked at the track to see that it was all right. The officials examined the bridge structure and found it strong and safe in every respect."

Passenger Rates on Steam Railways.

There have been so many reductions in passenger fares on steam roads during the current half-year, especially in Central Passenger Association and Trunk Line territory, where such rates would most affect the electric railways, that an enumeration of the more prominent changes may be of value. A large number of these took effect on November 1. On that date 2½ cents was made the maximum rate per mile on the Pennsylvania Railroad, Philadelphia & Reading, Lehigh Valley, Delaware Lackawanna & Western, Buffalo Rochester & Pittsburg, the Erie east of Buffalo and Salamanca, and small portions of the Baltimore & Ohio east of Pittsburg, and on nearly all lines in Indiana and small portions of Pennsylvania and West Virginia bordering on Ohio. On the same date 2 cents was made a maximum on the Boston & Albany. The New York New Haven & Hartford has been steadily making reductions until at present a large part of that system is on the 2-cent basis. On January 1 the Boston & Maine will make 2 cents the rate between practically all points within 100 miles of Boston, which means all of that road in Massachusetts and a considerable part in New Hampshire; and on all other divisions, except in mountain districts where the population is sparse, a horizontal cut of ½ cent will be made. The reductions will, of course, affect through rates to and from points in the territory where the new maximums apply and points outside of that territory. A majority of the through rates within Central Passenger Association territory were recently lined up with the sums of the new locals and were made effective on November 1.

Mileage books also have been changed. On September 1 the Baltimore & Ohio east of the Ohio river, the Erie east of Greenville, Pa., the Pennsylvania Railroad, the Buffalo Rochester & Pittsburg and the Bessemer & Lake Erie began the sale of 1,000-mile books at $20, good for bearer over the selling line. The Buffalo Rochester & Pittsburg book is the same as the books of, and good interchangeably on, the New York Central, Central of New Jersey and Philadelphia & Reading. On September 1 the Boston & Maine reduced the price of its 500-mile book good for bearer from $11.25 to $10, and at the same time extended its use, which was formerly confined to Massachusetts, to a limited territory outside of that state. The non-transferable book of the Trunk Lines Mileage Ticket Bureau, which is the interchangeable mileage of the Trunk Lines, was reduced on November 1 from $30 to $25, with a refund of $5 instead of $10. A similar change will be made in the Central Passenger Association book on December 1. The Trunk Lines interchangeable book is good on trains, while that of the Central Passenger Association is not.

Summing up, the 2-cent rate prevails largely in Massachusetts, Rhode Island, Connecticut and throughout Ohio, and the 2½-cent rate largely in New York, Pennsylvania and Indiana. These states comprise the greater and the more thickly settled part of what the Interstate Commerce Commission has designated as groups one, two and three. The density of passenger traffic in these groups is reported by the commission in 1904 as respectively 275, 237 and 116 per cent of the average for the United States. There is only one other group, that numbered ten and lying on the Pacific coast, where the density is above the average, all other groups being far below the average.

Cleveland Traction Situation.

The Cleveland street railway warfare, in which injunction suits, billboards and newspaper advertisements are the principal weapons, still continues without indications of abatement. The Cleveland Electric Railway Company holds to its demand for an extension of franchises under the "seven tickets for a quarter" plan with universal transfers, and the Municipal Traction Company, the "low-fare" line, still persists in its endeavor to secure franchises under the three-cent fare plan.

On October 1 the common pleas court refused to grant an injunction restraining the Municipal Traction Company from laying its tracks through Franklin Circle and within a few hours the company had laid the tracks, including the curves and two crossings over the Cleveland Electric tracks. At the council meeting on the same day the Municipal company offered a new franchise ordinance covering rights granted previously and all lines now operated by the Cleveland Electric whose franchises expire in 1908 and 1910. The ordinance contained a new feature, giving the city the right to reduce fares below three cents at any time when it is shown that the company is earning more than six per cent on its investment, and proposed to make free territory of that contained in a circle two miles in diameter, the center of which shall be Superior avenue and East Ninth street. Councilman Hitchins offered a resolution calling for the submission of the old company's offer to the people at a general election November 8, which was tabled.

On October 8 the Cleveland Electric Company applied for a blanket injunction restraining further work on the Municipal Traction lines and all interference with the Cleveland Electric, declaring all contracts between the city and the low-fare company void on the ground that Mayor Johnson is financially interested in the company. The city council on the same day adopted a resolution requesting the election supervisors to submit the offer of the two companies to a referendum vote of the people at the November election. On the same date the Cleveland Tramways Company was incorporated, with the intention, it was stated, of bidding for twelve east-side franchises, which have been asked by the Municipal Traction Company.

On October 13 the Municipal Traction Company was enjoined by Judge Beacom of the common pleas court, from laying track on Fulton road near Lorain avenue The company claiming indefiniteness of the injunction continued with the work until 11 o'clock the next day, when the judge appeared in person and stopped the work. The company was fined $200 and costs for contempt and ordered to restore the street to its former condition. On October 19 the injunction was dissolved and the next evening the work of relaying the tracks was resumed. The work was done at night to prevent the chance of another injunction.

On October 20 in the blanket suit brought by the Cleveland Electric Company attacking the grants made to the Municipal Traction Company, Mayor Johnson testified under oath that he had assumed all financial responsibility for the Municipal Traction Company to the amount of $300,000 or $400,000; that he had guaranteed the stockholders against loss, and had guaranteed payment for equipment and material, but that he is not to participate in the profits. On October 23 Judge Phillips issued a temporary injunction prohibiting the joint use of the Cleveland Electric tracks from West Twenty-eighth street to West Twenty-fifth street by the low-fare company. During this week several plans were suggested for holding a referendum vote on the street railway question, but the board of electors decided that there was no legal way by which such an election could be held. On October 24 the Municipal Traction Company began laying tracks in Fourteenth street and the Cleveland Electric Company applied for an injunction restraining the Municipal Traction Company from taking advantage of its franchise over the Central avenue and Quincy street route. President Andrews of the Cleveland Electric Company was placed on the witness stand in an endeavor to elicit from him information that the Cleveland Electric Company stood behind the various law suits brought by private persons against the low-fare company, but no testimony of any importance could be obtained. Other Cleveland Electric officials were also called upon to testify, but refused to answer all important questions. Mayor Johnson was also placed on the stand several times during the week and admitted that he had bought stock for other persons in the east, that he had acted as adviser for the low-fare company and had allowed city officials to devote their time to the interests of the company, but persistently denied that he or any of his family held any stock in the company, or that he stood to receive any profits from the enterprise.

On October 25 the Electric Depot Company brought suit, attacking several Municipal Traction Company's rights on the east side, claiming that a majority of consents had not been legally obtained, and on October 26 the mayor retaliated by ordering the police to prevent the Cleveland Electric company from operating cars on Erie street on the ground that the franchises had expired. On October 28 the police, by the order of the mayor, also stopped the operation of the Cleveland Electric cars in East Ninth street on the same grounds. On October 30 Attorney Warrington of the Cleveland Electric company applied in the United States supreme court prohibiting the city and the Municipal Traction Company from interfering with it in the use of its tracks. On the next day a temporary injunction was allowed and the mayor immediately withdrew the police and operation of cars was resumed. The court also ordered the hearing for the next week in the matter of a permanent injunction. This case is expected to settle the question of whether the Cleveland Electric Company still has any rights in Quincy street and Central avenue, or whether these franchises shall be turned over to the Municipal Traction Company in accordance with a recent ordinance.

On November 1 the first car of the Municipal Traction Company was operated over Denison avenue and Fulton road to Franklin Circle with Mayor Johnson as motorman and a party of city officials and officers of the company on board. The next day regular service was operated with only one car, but more cars are expected in a few days.

United Railroads Fined for Violating Fender Ordinance.—Judge Cabaniss, of San Francisco, on October 19 fined the United Railroads the maximum fine of $500 for neglecting to provide a car on the Sutter street line with fenders.

Appraisement of Ohio Electric Roads Shows Increase.—The returns of the county auditors to the Ohio state board of equalization for the appraisements of the electric railways in the state shows an increase in valuation from about $10,000,000 in 1905 to about $11,650,000 in 1906, a gain of 16½ per cent.

Test of Municipal Ownership.—The municipality of Monroe, La., recently began the operation of an electric street car line. It is claimed that this is the first practical test of municipal ownership of street railways anywhere in the United States, and as a consequence the success of the enterprise will be watched with close attention. Two years ago, following the success of the city's move in taking over the water and lighting plants, the city charter was changed so as to permit it to operate and own a street railway system. The system just completed is first class in its equipment and compares favorably with the street railways of other cities of the same size.

Traction Station at Logansport, Ind.—The Indiana Union Traction Company has announced that it will soon build a new station at Logansport, Ind. The company has recently completed a terminal station at Muncie, described in the Electric Railway Review for October, page 628, and is now building one at Kokomo.

New Park for Toledo.—The Wonderland Park Company, recently incorporated with $100,000 capital stock, has leased 33 acres of land on Auburn avenue between Concord and Carson streets, Toledo, O., and is perfecting plans for the immediate construction of a completely equipped amusement park. Z. Z. Brandon is president of the company.

Double Conductor System Adopted in Houston.—The Houston (Tex.) Electric Company has adopted the double conductor system for the cars on its Washington street line during rush hours. When only one conductor was employed it was found necessary to run the cars at a low speed in order to collect all the fares before reaching the Grand Central passenger station.

Los Angeles Interurban May Carry Freight.—Judge Smith of the superior court at Los Angeles, Cal., has reversed a decision of a lower court in a test case brought to determine the right of the Los Angeles Interurban Railway Company to operate freight cars within the city, deciding in favor of the railway company. The city attorney has announced that the case will be appealed to the supreme court.

New York Subways.—The New York Rapid Transit Commission on October 4 voted to extend the present subway from Kingsbridge to Van Cortlandt Park. Chief Engineer Rice has estimated the cost of the extension at $735,000. The commission at the same time granted an extension of a year to the Hudson Tunnel Company, which is building the tunnel from Hudson and Greenwich streets to Jersey City.

Interurbans Not Required to Give Transfers on City Lines.—The supreme court of Ohio in the case of the Interurban Railway & Terminal Company versus the city of Cincinnati, has decided that interurban railways entering cities over the tracks of another company are not required to give transfers over the city lines. This decision reverses that of the circuit court of Hamilton county from which the case was appealed.

Joint Tariff With Electric Line.—Effective on November 4 a joint rate with the Chicago & Milwaukee Electric Railroad was made by the Illinois Central applying to carload cabbage from Racine and other points in Wisconsin to Vicksburg, New Orleans, Natchez and Memphis. This is to be extended to all Illinois Central points in the lower Mississippi valley. This is probably the first joint tariff of electric and steam roads in the middle west.

Portland Council Tests Fenders.—A special committee of the city council of Portland, Ore., has been appointed to investigate different makes of car fenders, with a view to forcing the street railway companies to adopt the one which is considered best. On September 30 the committee witnessed a number of tests of four different fenders which picked up dummies representing human figures while the cars were operated at various speeds. Several other tests will be held before a decision is reached.

Annual Meeting Metropolitan Street Railway Association.—The tenth anniversary of the Metropolitan Street Railway Association, an organization of the employes of the New York City Railway Company, was held at Carnegie Hall, New York, on October 6. The report of the treasurer shows that the association is in a prosperous condition financially, cash on hand and investments amounting to $37,297. A total of $35,265 was disbursed in sick benefits and death claims during the year. The meeting was addressed by President H. H. Vreeland.

Supreme Court of Illinois Leaves Chicago Free to Regulate Cars.—The supreme court of Illinois on October 24 reversed a decision of the circuit court of Illinois which had declared the "public comfort" ordinance of the Chicago city council illegal and restrained the city from enforcing it. The ordinance in question provides for the proper heating, ventilation and scheduling of cars and stipulates that sufficient cars must be run to prevent overcrowding. The supreme court did not pass upon the validity of the ordinance but simply denied the jurisdiction of the lower court.

Mr. H. C. Pirrung, chairman of the Conventions Committee of the Columbus Board of Trade, in a letter to the Electric Railway Review dated October 30, 1906, requests that we express to the officers and members of the American Street & Interurban Railway Association and its allied associations, the thanks of the conventions committees and the citizens of Columbus for the many letters that have been received at Columbus congratulating the energetic conventions committee and the hospitable city which it represents for the warm welcome accorded the convention delegates and guests.

Franklin Institute Medal for Moving Sidewalk.—The Franklin Institute of Philadelphia has awarded the John Scott Legacy Premium and Medal to Max E. Schmidt, Civil Engineer of New York, for "decided improvements which he has made with a view of bringing the moving platforms into daily practical use as a means of transportation in large cities." These improvements are covered chiefly by thirty-two claims contained in U. S. patent No. 747,090 issued on December 15, 1903. In reviewing these claims the committee on "Science and the Arts" of the Franklin Institute finds "that from an engineering standpoint a great improvement has been made, the construction required by the later patent being much more substantial than the original form. The flexible rail is entirely eliminated, and the great part of the machinery is stationary, and will permit inspection at any time. With the present construction much sharper curves for the alignment of the road are admissible. The construction is such that derailment or any other serious accident seems remote."

Detroit Defeats D. U. R. Franchise Plan.—The proposition of the Detroit United Railway to give reduced rates of fare in consideration of an extension of its franchises from 1909 to 1924 was defeated by a referendum vote of the people on November 8. The company offered to give 10 tickets for a quarter during the hours of going to and returning from work and six tickets for a quarter at other times, with universal transfers, and for two weeks before the election had been selling tickets at these rates as an experiment. After the election the low-fare tickets were withdrawn. The people have demanded a straight three-cent fare.

Seeing East St. Louis.—The first of a series of daily trolley excursions "seeing East St. Louis," was held on October 22 over the lines of the East St. Louis & Suburban Railway, under the auspices of the East St. Louis Real Estate Exchange, and will be continued through the pleasant days of the fall, for the purpose of exploiting the city. The car started from Third street and Washington avenue, St. Louis, and passed over all the lines in East St. Louis, while a representative of the Real Estate Exchange explained the points of interest. The fare charged is 20 cents, the usual round-trip rate between East St. Louis and St. Louis.

Interurban Mileage Book for Ohio and Indiana Lines.—Announcement has been made that the Schoepf-McGowan lines will shortly place on sale an interchangeable mileage book, good on any of the syndicate roads in Ohio and Indiana. This book will be sold for $15, will be good for 1,000 miles, and will be transferable. The roads over which this mileage book may be used include: Indiana Union Traction, Indianapolis & Northwestern, Indianapolis & Western, Indianapolis Coal Traction, Indianapolis & Martinsville, Indianapolis & Eastern, Richmond Street & Interurban, Ft. Wayne & Wabash Valley, in Indiana; and the Indiana Columbus & Eastern, Lima & Toledo and Cincinnati Northern, in Ohio.

Interurbans Increase Population in Iowa.—Interurban railway officials in Iowa have recently called attention to the increase in population during the past few years in several districts in Iowa penetrated by the interurban railways, while the population of the state as a whole decreased 30,000 between 1900 and 1905. Between Waterloo and Waverly, which are connected by an electric railway, the population in the townships exclusive of the towns themselves, increased from 3,845 to 4,805. The population in the townships between Iowa City and Cedar Rapids, outside of towns, increased in the same period from 11,512 to 13,456. The townships between Des Moines and Colfax, exclusive of towns, increased from 8,633 to 9,178.

Observation Car for Toledo.—The Toledo Railway & Light Company has recently built an observation car which will be put on a regular schedule next summer for the accommodation of sight-seers. The new car, which is named "Toledo," is 47 feet long, and besides the passenger compartments contains a kitchen and a lavatory. The interior is finished in light mahogany and is handsomely furnished. The windows are 4 feet wide, with a narrow framework so as to interfere with the view as little as possible. During the winter the car will be used by the officials for inspection trips. The car was built in the company's shops under the supervision of Mr. C. A. Brown, master mechanic, according to designs furnished by General Manager L. E. Beilstein.

Coming Exposition of Safety Devices.—Last month the press very generally notified the public of the exposition of safety devices which the American Institute of Social Service proposes to hold in New York, January 28 to February 9, 1907. It is announced that gratifying interest is being shown by the inventors and manufacturers of devices for protecting the lives and limbs of workers and of the general public and applications for space are being filed in the order of their receipt. European co-operation has been generously pledged. The Belgian minister of labor has promised a large part of the Belgian exposition of safety devices and housing. Requests for information regarding space should be made to Dr. William H. Tolman, director, 287 Fourth avenue, New York.

Another Hearing on New York Elevated Plans.—On November 2 the board of rapid transit commissioners in New York City listened again to appeals made by residents of the Bronx to permit the Interborough Rapid Transit Company to lay additional tracks on its Second and Third avenue elevated lines. The previous hearing on this subject occurred in June and was reported in the July issue of the Electric Railway Review. At that time, after listening to representatives of various art, reform and civic organizations the board voted to refuse the franchise. At the hearing on November 2 arguments were presented by the same organizations. The board referred the matter to the committee on plan and contracts.

Beechwood Park.—The Beechwood Park Amusement Company, Philadelphia, was organized a few weeks ago for the purpose of building and operating a park on the line of the Philadelphia & Western Railroad, which has nearly completed its road from Sixty-third and Market streets, Philadelphia, to Wayne, Pa. The company has purchased for this purpose about 20 acres of woodland, rich in natural beauty, along Cobb's Creek, about three miles from the city limits of Philadelphia, and will begin soon the work of converting it into an up-to-date amusement park and picnic ground, to be known as Beechwood Park. Experts in planning amusement places have been over the ground and submitted plans. By the first of the year it is expected that the Philadelphia Rapid Transit Company's elevated road to the city limits will be in operation, and the Philadelphia & Western hopes to have its line completed at the same time, so that the park may be reached in 19 minutes from the city hall. Mr. E. E. Downs, 443 Mint Arcade Building, Philadelphia, is president of the company.

Old Stage Routes.—The November number of The Third Rail, a monthly published in the interests of the employes of the Brooklyn Rapid Transit Company, contains an interesting article on "Old Stage Routes," the first of a series which will relate the history of the development of the present Brooklyn Rapid Transit system from the earlier forms of transportation. The present article deals with the first days of the "King's Highway" which extended from "Broockland Ferry," now Fulton Ferry, to Flatbush, over what is now Fulton street, and the "Royal Mail Route," by which mail and passengers were transported from New Amsterdam, across the Hudson by ferry, and from "Broockland Ferry" by stage coach to Flatbush, Gravesend, New Utrecht and what is at present Fort Hamilton.

Importation of Electric Current.—At 11 o'clock on the morning of November 12, Secretary of War W. H. Taft will hold a hearing in Washington, D. C., on the question of transmitting Canadian power into the United States at Niagara Falls. The hearing will be governed to a great extent by the facts contained in the report made to the secretary by Capt. Charles W. Kutz, of the army corps of engineers, who visited Niagara Falls during the summer and made a very thorough investigation of all the power plants and the projects for transmission. Captain Kutz in his report recommended that the Niagara Lockport & Ontario Power Company be permitted to transmit 60,000 horsepower into the United States; the Niagara Electrical Transmission Company 37,500 horsepower, and the Niagara Falls Power Company 60,000 horsepower, making a total of 157,500 horsepower.

Attorney General Holds Wisconsin Electric Railways Under Jurisdiction of Commission.—The attorney general of Wisconsin, in response to an inquiry from the railroad commission, has given an opinion in which he holds that all electric railways extending beyond the limits of cities or villages are under the jurisdiction of the commission. This interpretation of the law is of wide importance, as it will, if sustained by the courts, give the rate commission power to regulate rates and service on all interurban railways in the state. "I am unable," says the attorney general in winding up his opinion, "to escape the conclusion that the act creating the commission and defining its powers does apply to all railroads except street and electric railroads engaged solely in the transportation of passengers within a city and private railways not doing business as common carriers."

Massachusetts Railroad Commission to Test Safety Appliances.—The Massachusetts Board of Railroad Commissioners recently held a hearing for the purpose of investigating safety appliances for use on electric railways, and about a hundred different inventors or promoters appeared ready to show or explain their various devices, including fenders, block signals, headlights, switch devices, ventilators, fire extinguishers, etc. At the hearing only a cursory examination was made and the matter was turned over to Commissioner George W. Bishop, who has arranged for a special car on the Newton Street Railway, which will be used for demonstrating various appliances intended to safeguard the operation of cars. The inventor and promoters will all be given an opportunity for showing the merits of their devices and Mr. Bishop has arranged with those who desired it for a practical test.

Executive Committee Meeting, American Association.—On the adjournment of the meeting of the American Street and Interurban Railway Association, Friday, October 19, the newly-elected executive committee met. Mr. Bernard V. Swenson was re-appointed secretary and treasurer of the association. The question of removing the headquarters of the association from No. 60 Wall street to the new United Engineering Building (the gift of Mr. Carnegie to the national associations of electrical, mechanical and mining engineers) on 39th street near Fifth avenue, was discussed and referred to the president and the secretary. The secretary announced that communications had been received from Chicago, Boston, Atlantic City, Columbus, and the Jamestown Exposition Company extending invitations to the association for its 1907 convention. The place of holding the 1907 meeting was discussed informally, but action deferred till a later meeting. The matter of publishing the reports of the committees on "Municipal Ownership" and "Public Relations" was discussed and action deferred until more careful consideration could be had.

Wisconsin Electric and Interurban Railway Association.—Representatives of 14 electric railway companies in Wisconsin met at the Hotel Pfister in Milwaukee on October 29 and took the initial steps in the formation of the Wisconsin Electric and Interurban Railway Association, the objects of which were stated to be: "The discussion and recommendation of methods of construction, management and operation of electric properties and interurban railways, and safeguarding the interests of the same. The establishment and maintenance of a spirit of co-operation among the members, and the encouragement of friendly relations between the companies and the public. The acquisition of experimental, statistical, and scientific knowledge relating to the construction, equipment, and operation of electric properties and interurban railways and the diffusion of this knowledge among the members." A second meeting was held at the same place on November 3 and the following officers were elected: President, H. D. Smith, secretary of the Wisconsin Light, Heat, Power & Traction Company, of Appleton; first vice-president, Thomas Higgins, president of the Manitowoc & Northern Traction Company; second vice-president, F. W. Montgomery, president of the Madison & Interurban Traction Company; third vice-president, Herbert Warren, general manager of the Duluth-Superior Traction Company; secretary-treasurer, Clement C. Smith, president of the Columbia Construction Company, Milwaukee.

Armour Institute of Technology.—The fourteenth annual year book of Armour Institute of Technology, recently issued, contains a history of the school since its foundation in 1892 and the usual list of faculty members, courses and equipment, and register of students and alumni, as well as a large amount of general information in regard to the government, organization, buildings, etc. The total number of students registered for the year 1905-1906 was 1,735 including those enrolled in the evening and summer courses. A bulletin of the evening courses offered by the Institute has also been issued. These courses are chiefly engineering and are selected with special reference to the needs of those who are engaged in technical pursuits during the day. Several new courses have been added this year and instruction is now given in the various branches of mechanical, electrical, telephone, fire protection, civil and chemical engineering.

Electric Traction Weekly.—Announcement has been made of plans for the publication of a new journal devoted to the field of electric traction to be known as "The Electric Traction Weekly." The aim of the paper, as stated by the publisher, is to make it a record of practice and progress in electric traction, devoted to the practical side of city and interurban railway construction, maintenance and operation. The publication office will be Cleveland, O., and the first issue of the paper is to appear about December 1. The organization will be known as the Kenfield-Fairchild Publishing Company with officers as follows: Hiram J. Kenfield, formerly eastern manager of the Street Railway Review, president and manager; C. B. Fairchild, Jr., formerly associate editor of the Street Railway Journal, vice-president and editor; George S. Davis, formerly Ohio editor of the Street Railway Journal, secretary and associate editor; F. L. Heath, Hastings, Mich., treasurer.

New York Elevated Bridge Loop Plan Defeated.—The New York Rapid Transit Commission on October 25 defeated the proposition to build an elevated loop in Delancey street and the Bowery, connecting the Manhattan terminals of the Brooklyn and Williamsburg bridges, to relieve the traffic congestion at those points. This subject has been before the commission in one form or another for six years. The principal objection to an elevated loop has been on the part of those who do not wish to see the streets defaced by any more elevated structures. The chief engineer and the counsel of the board were then instructed to prepare plans for a subway loop, which is at present the only alternative. The commission did not put itself on record as favoring the subway plan, but simply wished to get the matter in shape for a vote. There are also several serious objections to this plan, chief of which is that the cars now operated by the Brooklyn Rapid Transit Company, with whose lines it is desired to connect, are not suitable for subway operation, and that if the subway were operated by another company two fares would be required.

Mr. Ramsey's Chicago-New York Air Line Project Different.—Joseph Ramsey, Jr., states that his proposed New York-Chicago air line has no connection with the other widely-advertised electric air lines between New York and Chicago. Mr. Ramsey is quoted as follows in the Buffalo Commercial: "Down in New York a couple of days ago one of my railroad friends from the West shook hands with me and wanted to know how my 10-hour New York-Chicago electric airline was coming on. I have had letters by the score from friends of mine who wanted to know if the advertised scheme was mine, and if it was they would like to take some of the stock. The electric lines, which any reader of sense can see on the face, are purely bunco games, had been advertised in the West before my road was announced, but they took advantage of the news of my line to begin advertising in the eastern papers. I have absolutely no connection with any of those schemes. My road is to be a steam railroad, designed like any other road to haul freight and passengers. It may be that we shall find electric locomotives the best when the road is ready, in four or five years, but that is no reason for the line being called electric. The New York Central is not called an electric road because it is operating some of its trains with electric locomotives."

Damage to Pensacola Electric Company by Recent Storm.—Stone & Webster, of Boston, relative to the damage done to its property by the storm which recently swept over Pensacola and Mobile, has issued the following statement made by its representative sent to investigate the conditions: "The injury to the property of the Pensacola Electric Company was principally confined to the dummy line running to Fort Barrancas and the Government Navy Yard. The damage to the city railway lines and lighting system was very slight, and the power station suffered only from water which wet down some of the railway generators, the drying out of which delayed the resumption of railway service in the city for six days. The lighting service was resumed in two or three days. On the dummy line to the fort the Big Bayou trestle was entirely washed away, and through service cannot be resumed until it is rebuilt. It is planned, however, to relay the track beyond and span Big Bayou with a foot-bridge for transferring passengers. To this point cars have been operated since Oct. 7. In this connection, we would say that the work of electrically equipping this dummy line had not progressed far before the storm, and the funds provided for this work and for other improvements are still available. We estimate that the total loss to the company will be approximately $25,000, of which $4,000 is loss of earnings and $4,000 increased cost of new work under contract, due to increased price of labor and material."

PERSONAL MENTION

Mr. Charles Cooke has resigned as roadmaster of the New York & Long Island Traction Company.

Mr. S. R. Jaques, of Macon, Ga., has resigned as a director of the Macon Railway & Light Company.

Mr. J. Putnam Shunk has been appointed manager of the Hutchinson Interurban Railway, at Hutchinson, Kan.

Mr. Theodore J. Wool has resigned as counsel and director of the Norfolk & Portsmouth Traction Company, of Norfolk, Va.

Mr. Frank Cooley has been appointed superintendent of employment and inspection of the Brooklyn Rapid Transit Company.

Mr. Albert Burbank has been appointed superintendent of the Portsmouth & Exeter Street Railway, with headquarters at Stratham, N. H.

Mr. James Jardine, of Sacramento, Cal., has been appointed master mechanic of the Northern Electric Company, with headquarters at Chico, Cal.

Mr. Henry B. Hane, of Marion, O., has been elected secretary of the Columbus Delaware & Marion Railway, succeeding Mr. Walter A. Black, of Dayton, O.

Mr. George W. Rounds, superintendent of the Houghton County Street Railway, at Hancock, Mich., has been transferred to the Terre Haute, Ind., Traction & Light Company.

Mr. H. Baluss has been appointed general superintendent of the Cincinnati Georgetown & Portsmouth Railroad, with office at Cincinnati, O., succeeding Mr. H. E. Sawyer, resigned.

Mr. Will R. Payne, of Rushville, Ind., has been appointed civil engineer of the Indianapolis Columbus & Southern Traction Company, of Columbus, Ind., succeeding Mr. George Bushnell, resigned.

Mr. C. N. Duffy, who recently resigned as secretary and auditor of the Chicago City Railway Company, has been appointed comptroller of the Milwaukee Electric Railway & Light Company.

Mr. James H. Kinney, assistant manager of the Steubenville, O., Traction & Light Company, has resigned to take a position with the Utah Gas Light & Coke Company, of Salt Lake City, Utah.

Mr. Charles B. Lamb, who for some time has been the right of way agent for the Milwaukee Electric Railway & Light Company, has been appointed as chief of the company's publicity department.

Mr. Frank D. Norveil, assistant general passenger and freight agent of the Schoepf-McGowan lines in Indiana, has been appointed general passenger and freight agent, succeeding Mr. F. D. Wheeler, resigned.

Mr. S. W. Coleman, electrical engineer and master mechanic of the Petaluma & Santa Rosa Railway, of Petaluma, Cal., has been appointed general manager of the Union Traction Company, Santa Cruz, Cal.

Mr. H. Hartford, foreman of the Coney Island & Brooklyn Railroad Company's repair shops in Brooklyn, N. Y., has been appointed to a similar position with the Consolidated Railway Company, at Hartford, Conn.

Mr. George Moore, who was formerly connected with the electrical department of the Lake Shore Electric Railway, has been appointed master mechanic of the Springfield & Xenia Traction Company, with office at Emery, O.

Mr. William J. Shealy has been appointed manager of the Ogden & Northwestern Railway, at Ogden, Utah, and will have charge of the electrification of that road. Mr. Shealy has been connected with the Southern Pacific Company.

Mr. C. W. Ricker, formerly engineer of power houses, substations and electrical distribution of the Interborough Rapid Transit Company, of New York, has become associated with the Cleveland Construction Company, Cleveland, O.

Mr. F. A. Boutelle, superintendent of transportation of the Columbus Newark & Zanesville Electric Railway, at Newark, O., has resigned to take a similar position with the Puget Sound Electric Railway and the Tacoma Railway & Power Company, of Tacoma, Wash.

Mr. A. J. McPherson has been appointed superintendent of equipment of the Worcester Consolidated Street Railway, Worcester, Mass., in place of Mr. Charles A. Barton, resigned to become superintendent of motive power of the Rio Janeiro Street Railway Light & Power Company.

Mr. Nathan S. Eldredge has resigned as assistant superintendent of the Rutland (Vt.) Railway Light & Power Company to become connected with the S. F. Bowser Company, Fort Wayne, Ind. Mr. W. H. Horton has been appointed to succeed Mr. Eldridge as assistant superintendent.

Mr. W. E. Moore, heretofore general superintendent of the West Penn Railways, with office at Connellsville, Pa., has been appointed general manager. He succeeds Mr. W. S. Kuhn, of Pittsburg, Pa., who has been president and general manager, and who still retains the office of president.

Mr. F. A. Hewitt has been appointed general superintendent of the Eastern Pennsylvania Railways Company, which controls several roads in Schuylkill county, Pa., with office at Pottsville, Pa. Mr. H. C. Fritsch, assistant superintendent of the Tamaqua & Lansford Street Railway, of Lansford, Pa., has been appointed superintendent of the Eastern division of the Eastern Pennsylvania, and Mr. Joseph B. Hoellman has been appointed superintendent of the Pottsville Union Traction Company division.

Mr. John H. Merrill has resigned as secretary of the Central Electric Railway Association to become manager of the Choctaw Railway & Lighting Company, of South McAlester, I. T. The office of secretary will be held until the end of the year by Mr. W. F. Millholland, treasurer, Indianapolis, Ind.

Mr. Frank H. Bowen, division superintendent of the Public Service Corporation of New Jersey, at Elizabeth, has been appointed division superintendent of the Pawtucket, R. I., Street Railway division of the Rhode Island Company, succeeding Mr. R. R. Smith, who resigned several months ago.

Mr. A. A. Anderson, general superintendent of the Indianapolis & Cincinnati Traction Company, with office at Rushville, Ind., has been appointed general manager of the Indianapolis Columbus & Southern Traction Company, with office at Columbus, Ind., succeeding Mr. William G. Irwin, resigned to engage in other business.

Mr. J. W. Hicks, superintendent of transportation of the Rochester Railway, Rochester, N. Y., has been appointed assistant general manager. Mr. E. J. Wilcoxen, superintendent of the Sodus Bay division, has been appointed superintendent of transportation, succeeding Mr. Hicks, and Mr. B. C. Amesbury has been appointed to succeed Mr. Wilcoxen.

G. W. Dunlap.

Mr. G. W. Dunlap, whose portrait is presented herewith, was recently appointed superintendent of motive power and machinery of the Worcester Consolidated Street Railway, Worcester, Mass., to succeed Mr. Edwin A. Sturgis, who resigned to go with the Massachusetts Electric Companies. Mr. Dunlap, after serving three years as a machinist in the Portland Locomotive Works, began his railroad career at the age of 20 years as a locomotive engineer on the Maine Central Railroad. In 1889 he became engaged in electrical work and was later chief engineer of several electric railway plants in Massachusetts. Since 1900 he has been engaged in the electrical equipment of textile mills and was for a time superintendent of the Stevens & Deval Mills at Fall River, Mass., installing a 2,600-horsepower plant. On April 1, 1906, he was appointed chief engineer of the Tremont street power station of the Worcester Consolidated Railway, which position he held until he was appointed to his present position of superintendent of motive power and machinery.

Mr. H. C. Page, of Springfield, Mass., general manager of the Springfield Street Railway, has been appointed general manager also of the Woronoco and the Western Massachusetts street railways, succeeding Mr. A. D. Robinson, of Westfield, Mass., resigned. Mr. William H. Savery, of Westfield, heretofore superintendent of the Woronoco Street Railway, has been appointed superintendent of the Westren Massachusetts Street Railway also.

Mr. J. R. Harrigan has resigned as general manager of the Canton-Akron Railway, of Canton, O., which has been acquired by the Northern Ohio Traction & Light Company, and Mr. Charles Currie, general manager of the latter company, has had his jurisdiction extended over the lines controlled by the Canton-Akron. George E. Barber, trainmaster of the Northern Ohio, has been appointed division superintendent and Mr. John Freeman, of Akron, has been appointed superintendent of the Tuscarawas division, succeeding Mr. Wm. J. Goldthwaite.

Mr. R. S. Ives, superintendent of construction of the Chicago & Milwaukee Electric Railroad, in charge of the extension from Kenosha to Milwaukee, has been appointed superintendent of that road succeeding Mr. E. L. Des Jardins, resigned to engage in other business, effective on November 1. Mr. Ives formerly held the position of superintendent of the Chicago & Milwaukee, but resigned to take a position with the Shawnee (Okla.) Traction Company, which he later left to return to the Chicago & Milwaukee as superintendent of construction. His headquarters will be at Highwood, Ill.

Mr. C. F. Franklin, receiver and general manager, has announced the following appointments: Mr. F. E. Anderson has resigned as electrical superintendent of the Toledo & Western Railway, with office at Sylvania, O., and that office is abolished. Mr. Ira Scofield, master mechanic at Sylvania, has been appointed superintendent of motive power and equipment, in charge of shops, electrical and steam equipment, reporting to the general manager. Mr. William Denton has been appointed engineer of power station at Sylvania, reporting to the superintendent of motive power and equipment. Effective on October 18.

CONSTRUCTION

TRACK AND ROADWAY.

Allegheny Valley Street Railway.—This line from Aspinwall to Tarentum, Pa., 18 miles, passing through Montrose, Harmarville, Cheswick and New Kensington, was recently placed in operation.

Augusta Oakland & Waterville Street Railway.—The Maine railroad commission has approved the location of this road, from Oakland through Sidney to Augusta, Me., about 18 miles. The promoters are: E. J. Lawrence, Fairfield; Cyrus W. Davis, Waterville; Amos F. Gerald, Fairfield; Stephen A. Nye, Fairfield, Ralph M. Gilmore, Waterville.

Aurora De Kalb & Rockford Electric Railway.—Officials have announced that a contract will soon be let and that construction will be commenced at once on a line out of Aurora to Pigeon Hill, on Benton street, High street and Union street, with the intention of completing the line this winter. Fred Dolph, secretary, Aurora, Ill.

Boston Elevated Railway.—The Massachusetts railroad commissioners have refused to grant this company's petition for a station in connection with an elevated structure at Forest Hills, Mass.

Boston & New York Electric Railroad.—This company has applied to the Massachusetts railroad commissioners for a certificate of public convenience for an electric railroad between New York and Boston. The promoters state that this will be an air line which will greatly reduce the present time between those cities. A. B. Leach and O. B. Clancy, of Boston, and others are interested.

Centralia & Central City Traction Company.—This company is completing a spur in Centralia, Ill., to the city cemetery, and is placing material for an extension to Sandoval, about six miles. J. P. D. Francis, president, St. Louis, Mo.

Charleston & Summerville Electric Railway.—Contracts have been let for the construction and equipment of this road which will be built from Charleston to Summerville, S. C., 27 miles. The power house is to be located about 9 miles outside of Charleston. The overhead construction will be of the catenary type, with 120-foot span, of No. 000 hard drawn copper wire.

Chicago & Joliet Electric Railway.—This company is making preparations for building a branch from Summit to Lagrange, Ill.

Chicago & Milwaukee Electric Railroad.—It is reported that this company has purchased what is known as Krueger lodge camp on Root river near Racine, Wis., and that it intends to build a park on the site. A. C. Frost, president, Chicago, Ill.

Chicago Des Plaines & Fox River Railroad.—This company is making plans to begin work in the spring on a line from Chicago to McHenry, Ill., with a branch to Lake Geneva, Wis. H. E. Emerson, of Chicago, engineer.

Chicago, Ill.—Electric trolley cars were operated on the North Clark, Wells street and Cottage Grove avenue lines for the first time on October 21, in place of cable cars. Several blockades occurred at first, due to the inexperience of the motormen.

Chicago Lake Shore & South Bend Electric Railway.—It is reported that the Cleveland Construction Company, of Cleveland, O., has been awarded the contract for building this road from Chicago, Ill., to South Bend, Ind. J. B. Hanna, of Cleveland, is president.

Chestertown, Md.—A contract has been awarded to D. E. Baxter & Co., of New York, for building an electric line from Tolchester to Chestertown, Md., via Fairlee and Georgetown. The entire right of way has been secured.

Cincinnati Reading & Middletown Electric Railway.—This company is being organized to build a line from Rose Hill north to Franklin, O., via Sharon and Middleton, 40 miles, to connect at Rose Hill with the lines of the Cincinnati Traction Company. G. M. Mallon, of Cincinnati, is interested.

Columbus Delaware & Marion Railway.—Work on the extension from Marion to Bucyrus, O., has been practically closed until next spring, when the work will be rushed to completion. All of the right of way for the extension from Prospect to Richmond has been secured and work on this will be started next spring.

Consolidated Railway.—This company has begun the construction of its line from Meriden to Middletown, Conn., and also the line from Rockville to Stafford Springs, 15 miles.

Coos Bay Railway & Terminal Company.—Seymour H. Bell, treasurer and general manager, Ontario, Ore., writes that this company will begin construction next year on a road from Marshfield to North Bend, Ore., six miles. The same interests now own the lighting plants of Marshfield and North Bend and will connect them by a transmission line. They are now in the market for part of the electrical equipment. President, Henry Hewitt, Jr., Tacoma, Wash.

Evansville Princeton & Vincennes Traction Company.—This company has let a contract to the Ware Company of St. Louis for the building of 8 miles of track between Evansville and Darmstadt, Ind., which will take the place of the present route between these points.

Fort Wayne & South Bend Railway.—L. P. Huntoon of Fort

Wayne, Ind., has been appointed chief engineer and has begun surveys for the entrance into Fort Wayne.

Goff's Falls Litchfield & Hudson Electric Railway.—It is expected that this road, from Manchester through Goff's Falls, Litchfield and Hudson to Nashua, N. H., 17 miles, will be completed some time in December, thus making possible a through trip by electric lines from Concord, N. H., to Boston, Mass., 75 miles.

Hagerstown & Northern Railway.—This company's new 10-mile extension from Hagerstown to Shady Grove, Pa., was completed this month and opened for traffc. C. W. Lynch, of Harrisburg, Pa., is president.

Hastings, Neb.—H. C. Long, of Boston, Mass., is promoting an electric line to run from Hastings, Neb.

Illinois Traction Company.—It is now stated that the line from Bloomington to Peoria will be completed by December 1 or January 1 unless unexpected delays occur. This line will be operated by the multiple-unit single-phase system. The Lincoln-Springfield line is expected to be in operation by November 1. After trying for over a year to get a right of way through East St. Louis an arrangement has just been completed whereby the company's cars will operate from Granite, the present terminus of the lines, to the Eads Bridge, over the tracks of the East St. Louis & Suburban Railway. Transfers will then be given to the bridge cars running into St. Louis. A petition for a franchise is now pending in St. Louis for the St. Louis Electric Terminal Railway, which will give the company terminal rights in St. Louis.

Indianapolis & Cincinnati Traction Company.—This company's extension from Rushville to Connersville, Ind., was opened for operation on October 27. The extension from Shelbyville to Greensburg will also be completed at an early date. Charles L. Henry, of Indianapolis, receiver.

Indianapolis & Louisville Traction Company.—It is reported that work on this line between Jeffersonville and Seymour, Ind., is progressing rapidly. Grading is entirely completed as far north as Crothersville, and track is being laid at Scottsburg. Considerable work has been done on the power house and car barns at Scottsburg.

Indianapolis Columbus & Southern Traction Company.—The temporary injunction restraining the company from laying tracks across the Pennsylvania tracks in Columbus, Ind., has been dissolved by the circuit court, and the work will now continue. The company is building an extension to Seymour. A. A. Anderson, of Columbus, is general manager.

Interurban Railway (Des Moines).—The Beaver Valley division, extending from Des Moines to Perry, Ia., 37 miles, via Woodward, Herrold, Moran and Grange, will be opened for freight and passenger service the first week in November. The company has decided upon the construction of an extension of its Colfax division from Colfax to Newton, Ia., 11 miles; contracts to be awarded about January 1. An extension from Colfax southeast through Seevers to Prairie City, 6 or 7 miles, is also contemplated. Grade reduction work between Des Moines and Colfax to bring the maximum to 1 per cent will be carried forward at once. H. H. Polk, president and general manager; F. C. Cummins, chief engineer; both of Des Moines.

Johnstown Ebensburg & Northern Railway.—The Eldenbel Construction Company of New York is reported to have secured the contract for building this road from Johnstown to Ebensburg, Pa., 30 miles. J. H. Milholland, chief engineer, Pittsburg, Pa.

Joliet & Southern Traction Company.—Construction has started in Joliet, Ill., on this company's lines which include 10 miles of track in Joliet, and 48 miles of interurban track from Joliet to Dwight, Ill. The company has franchises covering four streets in Joliet, each of which will furnish an inlet for an interurban line. The present work is on Granite street, where several blocks of track have been laid, to give a new entrance to the Joliet Plainfield & Aurora Railroad, and is expected to be completed in 90 days. The Fisher Construction Company, of Joliet, has the contract for the work, and will own a large majority of the stock of the properties, when the Joliet & Southern and the Joliet Plainfield & Aurora are consolidated after construction is finished.

Lansing, Mich.—Surveys are being made for an electric line between Lansing to Grand Ledge, Mich.

Louisville & Eastern Railroad.—The Marion Contract & Construction Company is asking bids for the entire track construction of this road from Beechwood to Frankfort, Ky., 46 miles. Specifications and plans are on file at the office of J. B. Walker, chief engineer, Lyndon, Ky.

Meyersdale & Salisbury Street Railway.—This company is about to begin the construction of its line from Garrett to Salisbury, Pa., via Meyersdale and Boynton, 13½ miles, which will cost about $300,000. The bonds have been underwritten and work will start in about 10 days. The company requests estimates on four four-motor 50-horsepower interurban cars, one combined freight and express car, overhead construction for 13½ miles, and complete power house equipment, including two 300-kilowatt generators. Orran W. Kennedy, of Uniontown, Pa., president. Office, Pittsburg, Pa. Further information may be obtained from W. W. Staub, Pittsburg & Allegheny Valley Railway, 612 Keystone building, Pittsburg, Pa.

Montgomery Traction Company.—Surveys have been made for an extension from Montgomery to Wetumpka, Ala., and it is expected that work will begin next spring. R. D. Apperson, president, Lynchburg, Va.

Montreal Street Railway.—The road committee of the city council has approved a route proposed by the company from Cote and Craig streets to Iberville in the northeastern section of the city, using the tracks of the Montreal Terminal Railway.

Morgantown & Southern Railroad.—Ed. Herd, secretary and manager, writes that surveys have been completed from Morgantown to Fairmont, W. Va., 28 miles, and that contracts are to be let for the first 2½ miles within 30 days. J. W. Wiles, president; J. L. Johnson, chief engineer, Morgantown, W. Va.

Napa Valley Electric Railroad.—George Errington, of Napa, Cal., has been awarded a contract for grading the 18-mile extension of this road from Napa to St. Helena, Cal., through Yountville, Oak Knoll and Rutherford. L. J. Perry, of Napa, is general manager.

Northern Electric Company.—This company's line from Chico to Oroville, Cal., was opened for traffic between Oroville and Yuba City on November 1. C. S. Compton, of Chico, is chief engineer.

Ocean Shore Railway (San Francisco).—This company has resumed work on its 83-mile double-track electric line from San Francisco to Santa Cruz, Cal., which was suspended after the earthquake. Twelve miles of track have been completed at the Santa Cruz end, and Willets & Burr have the grading contract.

Ogden Rapid Transit Company.—The directors have appropriated $40,000 for electrifying the line of the Ogden & Northwestern Railway from Ogden, Utah, to the Utah Hot Springs, which has heretofore been operated by a dummy engine, and a committee has been appointed to take charge of the matter. Plans are also being considered for building a line to Brigham. N. C. Flygare, superintendent and purchasing agent, Ogden, Utah.

Ohio & Southern Traction Company.—Work has been started on this line which is to run from Columbus, O., to the Hartman stock farm south of the city. S. B. Hartman, of Columbus, is interested.

Omaha & Southern Interurban Railway.—This company's new line between Albright and Fort Crook, Neb., was opened for operation on October 19. W. A. Smith, general manager, Omaha, Neb.

Oskaloosa & Buxton Street Railway.—It is stated that cars will be running between Oskaloosa and Beacon, Ia., by November 15. Tracklaying is nearly completed and rapid progress is being made with the overhead work. Grading is also in progress from Beacon on to Buxton. C. B. Judd, Oskaloosa, chief engineer.

Philadelphia & Garrettford Street Railway.—Surveys are being made and it is said that construction will soon commence for a line from Garrettford to Media, Pa. Cars will run from Sixty-third and Market streets, Philadelphia, to Garrettford, over the lines of the Philadelphia & West Chester Traction Company, the controlling company. H. H. Aikens, Philadelphia, is president.

Pittsburg Railways Company.—This company has made surveys and is planning to build a road from Carnegie, Pa., to Wheeling Junction, W. Va.

Quebec & Saguenay Railway.—A contract has been awarded to John D. Cameron, of Quebec, for building this line along the north shore of the St. Lawrence river, 86 miles. R. Forget, of Montreal, is president; J. F. Guay, of Quebec, is chief engineer.

Riverside Railroad Company.—An official report states that grading has been commenced on this electric line from Reno to Lawton Springs, Washoe county, Nev., five miles, passing through Riverside Park, a pleasure resort owned by the company. At the terminus of the line a large hotel will be erected at the mouth of Hunter Creek canyon, with a hot-water natatorium. The Reno Construction Company has the contract. President, F. R. Nicholas; chief engineer, T. K. Stewart, of Reno, Nev.

Rock Island Southern Railroad.—This company has appropriated $1,250,000 for the purpose of extending its present line from Monmouth to Rock Island, Ill., and the locating survey will be made at once. The road now connects Galesburg and Monmouth. F. H. Lancashire, chief engineer, Davenport, Ia.

Royaltown & Elizabethtown Street Railway.—Eighty per cent of the right of way has been secured for this road, which is to connect Middletown and Mt. Joy, Pa., with branches to Lancaster and Lebanon, 52 miles in all. Surveys have been made, but arrangements for financing the project have not yet been completed. William Trimble, of Philadelphia, is president.

Spokane & Inland Railway.—Electric service has been opened between Spokane and Waverly, Wash., with the new motor cars which have recently been received. Three substations have been installed at Evergreen, Mt. Hope and Wavrly. Construction work on the Palouse branch is progressing rapidly and track has been laid 12 miles south of Waverly to Fairbanks. Work on the Colfax branch, which was discontinued because of lack of material, is now being pushed, and has been completed two miles beyond Spring Valley Junction. A. M. Lupfer, chief engineer, Spokane, Wash.

Spokane-Pend d'Orellle Rapid Transit Company.—An official report from M. F. Mendenhall, secretary, Spokane, Wash., states that the final survey has been completed for this road from Spokane, Wash., to Lake Pend d'Oreille, Idaho, with a branch 11 miles long to Fish Lake and Spirit Lake. Franchises have been secured in Spokane and Rathdrum, also the county franchises.

Practically all the right of way is secured; 70-pound rails will be used and over 86 per cent of the road is straight line. C. H. Reeves, president.

South Georgia Electric Railway.—This company expects to let contracts about November 15 for building a line from Milltown to Valdosta, Ga., 20 miles. Right of way and capital have been secured and the permanent survey will be started at once. Charles G. Peeler, manager, Milltown, Ga.

Southwestern Traction Company.—Bids are asked until November 15, for preparing the roadbed and subgrade of about 50 miles of line between Independence and Chanute, Kan. Specifications at office of Cudworth, Axtell & Co., engineers and contractors, Kansas City, Mo.

Springfield, Mass.—The Ley Construction Company, of Springfield, has the contract for building a line from Palmer to Fishdale, to connect the Springfield & Eastern Street Railway and the Worcester & Southbridge Street Railway systems.

Syracuse Lake Shore & Northern Railroad.—C. E. and J. S. Kaulback, Phoenix, N. Y., have been awarded the contract for building a 15-mile line from Baldwinsville to Fulton, N. Y. T. H. Mather, of Syracuse, is chief engineer.

Terre Haute Traction & Light Company.—Stone & Webster, of Boston, owners of this road, have instructed the local manager, C. F. Mordock, to proceed with the arrangements for building the line from Terre Haute, Ind., to Paris, Ill., and it is expected that the survey will probably be completed within two weeks. It is probable that an Illinois company will be incorporated to build the road and lease it to the Terre Haute company.

Toledo & Indiana Railway.—Riggs & Sherman, of Toledo, O., are making surveys for an extension from Delta to Defiance, O., via Liberty Center and Napoleon. It is reported that arrangements have been made for extending the line from Bryan, O., to Waterloo, Ind., to connect with the Toledo & Chicago Interurban Railway. A. B. Shepard, of Cleveland, vice-president and chief engineer.

Toledo Port Clinton & Lakeside Electric Railway.—This company, which now has its road in operation from Marblehead to Toledo, O., has completed a contract with the Toledo Railways & Light Company to use the latter's tracks to enter the city of Toledo, on Starr avenue and Main street, with a loop to turn the cars within the city. The new contract is to run 20 years and the compensation is to be 3½ cents per passenger for the first four years and three cents thereafter.

Twin City Rapid Transit Company.—Actual work on the construction of the tunnel under the Selby avenue hill in St. Paul, Minn., was started on October 15.

United Traction Company.—This company will extend its lines in Albany, N. Y., through Ten Broeck street and Livingston avenue to New York Central avenue, 2 miles. Herschel Benedict, of Albany, is chief engineer.

Washington Baltimore & Annapolis Electric Railway.—This company, which is building an electric line connecting Washington, Baltimore and Annapolis, has closed a contract with the General Electric Company for the single-phase electrical equipment of the line. Roberts & Abbott, Baltimore, engineers.

Waxahachie, Tex.—J. W. Martin, of Dallas, is making a preliminary survey for the Dallas Engineering Association, of a line from Waxahachie to Dallas.

Waynesville, Mo.—J. J. Burns, of St. Louis, is organizing a company to build an electric road connecting Waynesboro with Crocker, Mo., a point on the St. Louis & San Francisco, which it is proposed to extend later to connect Eldon and Mountain Grove.

Waynesville, Mo.—J. J. Burns, of St. Louis, is organizing a company to build an electric road from Waynesville to Crocker, Mo., and eventually from Eldon to Mountain Grove.

West Chester Street Railway.—The new extension from Gallagherville to Caln Station, Pa., was opened for traffic on October 13, and cars were operated on a 20-minute schedule. Within about a week cars will be run from West Chester to Coatesville as soon as the bridge over the Pennsylvania Railroad is completed.

Western Ohio Railway.—This company has nearly completed a short cutoff to avoid a sharp curve at Cridersville, O., which was recently the scene of a disastrous accident.

Windsor & Tecumseh Electric Railway.—The material for the construction of this road from Windsor to Tecumseh, Ontario, has arrived and construction will be started at an early date. The road was purchased by the Detroit United Railway some time ago after a portion of the roadbed was completed.

Winnipeg, Man.—R. D. Wilson has completed surveys for an electric line from Pointe du Bonnet to Pointe du Bois, and it is reported that construction will soon begin.

Winona Interurban Railway.—Cars will be operated in a few days over the first 10 miles of this company's line from Peru to Warsaw, Ind., which when completed will offer a through route from Indianapolis to Goshen, Ind. The grading on the entire line will be completed in 60 days. R. M. Murray, engineer, Winona Lake, Ind.

Worcester Consolidated Street Railway.—The Eastern Bridge & Structural Company, of Worcester, Mass., is building a steel bridge over the Boston & Maine Railroad at Sterling Junction to carry the electric railway tracks. The company is also relaying its Foster street line in Worcester with heavier rails.

POWER HOUSES AND SUBSTATIONS.

Charleston & Summerville Electric Railway.—Contracts have been let for the equipment of the power house for this road from Charleston to Summerville, S. C., which will be located 9 miles out of Charleston. The contract includes two 800-horsepower Snow gas engines, with a maximum capacity of 920-horsepower; two 600-kilowatt single-phase 25-cycle generators; two motor-driven exciter sets with 70-kilowatt transformers.

Indiana Columbus & Eastern Traction Company.—The Medway, O., generating station is being enlarged by the installation of two Westinghouse turbo-generators of 1,500 and 750 kilowatts capacity; condensers with a combined cooling surface of 4,500 square feet, manufactured by C. H. Wheeler, of Philadelphia, and two Babcock & Wilcox boilers of 525 horse-power capacity each. An addition 39 feet long is being built to the west end of the boiler-room and a 150-foot brick smokestack is being erected.

Indianapolis New Castle & Toledo Electric Railway.—George A. Williams has charge of the construction and equipment of the power house at New Castle, Ind., which the Allis-Chalmers Company is building for this road. The building will be 124x134 feet in area, 50 feet high, and will have concrete foundations, and steel columns, trusses, floor and roof supports. The walls will be of brick. The boiler room will contain three horizontal water-tube boilers, with mechanical stokers. The engine room will contain two 1,000-kilowatt 2,300-volt steam turbo-generators, one 400-kilowatt rotary converter, one 50-kilowatt exciter, six 350-kilowatt 2,300-33,000-volt transformers; three 150-kilowatt transformers, and four 33,000-volt oil switches. The Allis-Chalmers Company will furnish the electrical equipment and will also erect three substations, to be located between New Castle and Indianapolis. These will each contain three 150-kilowatt transformers, one 450-kilowatt converter, with switch-board, lightning arresters, etc.

New York Auburn & Lansing Railroad.—This company proposes to erect a power house at Genoa, N. Y., for its third-rail line from Ithaca to Auburn, N. Y., which will be equipped with two 800- or 1,000-kilowatt turbine engines and generators. W. L. Fairchild, 15 Broad street, New York, is the engineer in charge.

Rapid Railway (Detroit, Mich.)—This company is adding new machinery which will double the capacity of the substation in Port Huron, Mich., at Military and Griswold streets, for its own use and that of the City Electric Railway.

Union Traction Company of Kansas.—A large force of men is at work building the foundations for a power house just south of the car house at Independence, Kan.

Youngstown & Ohio River Railroad.—Perry Chubb, of Cleveland, has the contract for the construction of this company's power house at West Point, O., which will be built entirely of concrete. The building fill be T-shaped 60x100 feet and will be two stories high. Work has been started on the foundation. A concrete smokestack 166 feet high will be erected.

SHOPS AND SHOP EQUIPMENT.

Brooklyn Rapid Transit Company.—The foundations are being excavated for a large fireproof building for car barns and shops in the village of Maspeth, L. I.

Cleveland & Southwestern Traction Company.—A contract has been awarded to the Concrete Steel Company, of Cleveland, for the construction of an $80,000 building for car barns and repair shops at Elyria, O. The building is to be completed January 1.

Detroit United Railways.—This company's car barns at Ford City, Mich., were totally destroyed by fire on October 22. The three cars that were in the shed were saved. The loss is estimated at from $60,000 to $70,000. Defective wires are thought to have caused the fire.

Forest City Railway.—The contract for the new car barn on Denison avenue, Cleveland, has been awarded to John E. Thomas. The building will consist of a two-story office and waiting station, 22 by 70 feet and car barns 70 feet by 105 feet.

Lake Shore Electric Railway.—The car repair shops at Fremont, O., were burned on October 16, destroying four passenger cars and much valuable machinery and tools. The total loss is estimated at $100,000, covered by insurance. Work has already been started to rebuild the shops. Steinley Brothers, of Fremont, have the contract for rebuilding.

Public Service Corporation of New Jersey.—Henderson & Co., of Philadelphia, has the contract for erecting a brick car barn 137 by 321 feet and a repair shop 138 by 255 feet, at Camden, N. J.

Tampa & Sulphur Springs Traction Company.—A contract has been awarded to E. C. Blake for the construction of a car barn and office building at Tampa, Fla. The building is to be 200x84 feet. McGucken Brothers have the contract for the brick work. The cost is estimated at about $8,000.

United Railways & Electric Company.—It is reported that this company has purchased property at the southwest corner of North avenue and Gay street for the purpose of building another car barn. The contract for the erection of a new $125,000 car barn on Belvidere avenue opposite Electric Park, has been let to the Charles McCaul Company, of Baltimore.

FRANCHISES.

Atlanta, Ga.—The Atlanta Macon & Griffin Electric Railway, which proposes to build an electric line between the cities named, has applied for an extension of its local franchise from 30 to 50 years.

Barrie, Ont.—Fred Nicholls, of Toronto, has applied for a 25-year franchise for an electric railway, with heat and power rights. A company of local men have also applied for a 30-year franchise.

Belleville, Ill.—The city council has granted a franchise to the Duquoin Rapid Transit Company.

Burlington, Wis.—A 50-year franchise has been granted to the Milwaukee Electric Railway & Light Company.

Cherokee, Kan.—The city council has granted a franchise to the Pittsburg Railway & Light Company.

Defiance, O.—The Indiana Columbus & Eastern Traction Company has been granted a franchise to extend the Columbus & Lake Michigan steam road into the city and electrify it.

Everett, Wash.—The Snohomish Valley Railway has secured a franchise through Everett for its proposed line from Monroe to Seattle. G. M. Cochran, of Snohomish, is president.

Farmington, Mo.—The St. Francois county court has granted franchises for roads through the county to the St. Louis & Montesano Railway and the St. Louis & Southeastern Railway, both of which intend to build from St. Louis to Flat river.

Fremont, O.—A. H. Jackson and James Hunt have applied for a franchise on Front and Tiffin strets, representing a company which desires to take over the Fremont Street Railway and rebuild it.

Herrin, Ill.—The Coal Belt Electric Railway, of Marion, Ill., owned by the Missouri Pacific Railway, has secured a franchise to extend its line in Herrin up North Park avenue to the northern limits of the city.

Huntington, N. Y.—A franchise has been granted to the Huntington Railroad, which is building a road across Long Island.

Janesville, Wis.—The city council has granted a franchise to H. H. Clough and D. McAllister for the interurban road from Madison to Janesville.

Janesville, Wis.—As a result of an unfavorable franchise passed by the city council for the Janesville & Madison Interurban Railway, H. H. Clough, the promoter, has ordered work on the surveys suspended.

Los Angeles, Ca.—The Los Angeles-Pacific Company has presented a petition to the trustees of Ocean Park for a right of way over Mildred avenue from Pacific avenue to the ocean front.

Marysville, O.—The Magnetic Springs & Northern Electric Railroad, which is being constructed from Magnetic Springs to Richwood, Larue and Kenton, O., has been granted a franchise in Marysville.

Ossining, N. Y.—A franchise has been granted to the Hudson River & Eastern Traction Company, of which Francis A. Stratton is president, to build its road through the town.

Pensacola, Fla.—The city council has refused to grant the franchise asked for by A. A. Erickson and others of Selma, Ala., and New York for a street railway over certain streets.

Pomeroy, O.—Col. A. E. Boone has been granted a franchise for an electric line through the city.

Ravenna, O.—The Akron & Youngstown Electric Railway has applied for a franchise through Portage county.

Rochester, Minn.—W. P. Mason, representing the Minneapolis Rochester & Dubuque Traction Company, which proposes to build from Minneapolis, Minn., to Dubuque, Ia., has applied for a franchise through Rochester and for a local street railway system.

St. Petersburg, Fla.—The Bayboro Investment Company has been granted a franchise for an electric line from St. Petersburg to Point Pinellas, Fla., along Tampa Bay.

Sault Ste. Marie, Mich.—The franchise of the Trans-St. Mary's Traction Company has been extended to 20 years on condition that it build an extension from Sault Ste. Marie to the suburb of Algonquin.

Springfield, O.—The city council has granted a 25-year franchise to the Springfield Railway for an extension of its system through the manufacturing district in the northeastern section of the city.

Strathcona, Alta.—The Strathcona Radial Electric Railway has been formed and is seeking a franchise for a railway between Strathcona and Edmonton, Alta.

Vancouver, Wash.—Walter H. Moore and Lester B. French have applied for a franchise for a city railway system, agreeing to deposit $1,000 as a guarantee that the road will be completed next year.

Vickery, O. — The commissioners of Sandusky county have granted a franchise through this village to the Sandusky Fremont & Southern Railway.

Walla Walla, Wash.—A franchise has been granted to the Columbia & Walla Walla Traction Company for its proposed line from Dayton to Wallula. J. W. Morrow, of Waitsburg, is general manager.

FINANCIAL

Boston & Northern Street Railway.—The Massachusetts railroad commission has approved the petition of this company for permission to increase its capital stock $383,000 for the purpose of purchasing the Georgetown Rowley & Ipswich Railway and the Lowell & Woburn Street Railway. The purchase will be effected by exchanging the company's stock share for share for that of the purchased companies.

Chicago & Oak Park Elevated Railway.—The annual statement for the year ended June 30, 1906, contains the following items: gross earnings, $890,554; net earnings, $385,016; expenses, $505,538; deficit, $92,778, making a total deficit of $258,343.

Consolidated Railway (New Haven, Conn.)—The annual report for the year ending June 30, 1906, shows gross earnings of $3,788,376; operating expenses, $2,274,747; net earnings, $1,613,628; surplus, $77,925. The total number of passangers carried was 87,859,629.

Eastern Ohio Traction Company.—Robert D. Beatty, of Cleveland, general manager and the active head of the company, has been appointed receiver, in place of George T. Bishop.

Elmira Water Light & Railroad Company.—The New York railroad commission has authorized an increase of capital stock from $1,000,000 to $2,000,000, for the purpose of acquiring the Chemung County Gas Company and the Seneca Lake Traction Company.

Evansville & Eastern Electric Railway.—Officers have been elected as follows: President, W. H. McCurdy, succeeding J. C. Haines; vice-president, W. L. Sonntag, succeeding F. W. Reitz; treasurer, M. S. Sonntag, re-elected; secretary, M. B. Harper, re-elected. Office, Evansville, Ind. Eight miles of track has been laid, from Newburg to Hatfield.

Interurban Railway & Terminal Company (Cincinnati, O.).—This road, which runs from Fourth and Sycamore streets, Cincinnati, to Lebanon, O., has been leased for 99 years to the Union Gas & Electric Company.

Lake Shore Electric Railway.—The report for the year ended on September 30, 1906, shows the following results:

Gross earnings	$864,004
Operating expenses	471,597
Net earnings	392,407
Interest	244,965
Surplus	147,442

Marquette County Gas Light & Traction Company.—This company, which owns the street railways of Ishpeming and Negaunee, Mich., has been sold at a forced sale to Granger Farwell, of Chicago, a bondholder to the amount of $289,000.

New York City Railway.—The annual report for the year ended June 30, 1906, shows earnings and expenses as follows:

	1906.	1905.	1904.
Gross	$21,937,944	$20,888,124	$21,485,006
Expenses	12,624,783	12,871,423	12,127,856
Net	$ 9,313,161	$ 8,616,701	$ 9,357,150
Other income	424,744	444,963	408,998
Total income	$ 9,739,905	$ 9,061,304	$ 9,766,148
Taxes, rent, interest	11,950,903	11,858,246	11,162,919
Deficit	$ 2,212,998	$ 2,796,942	$ 1,396,771

No account is made of the special franchise tax, which is now in litigation.

New York New Haven & Hartford Railroad.—Attorney General Malone, of Massachusetts, has applied in the supreme court for an injunction against this company to restrain it from directly or indirectly subscribing for the stocks or bonds of certain domestic street railways, on the ground that such transactions are not allowed in its charter. The street railways named are the Worcester & Southbridge, Worcester & Blackstone Valley, Worcester & Webster, Webster & Dudley, Berkshire Street Railway and Springfield Street Railway.

Philadelphia Company (Pittsburg, Pa.)—This company, which controls the Pittsburg Railways Company, the United Railways Investment Company, of San Francisco, and several other lighting and railway companies, reports the following results for the nine months ending September 30, 1906:

Gross earnings from operation		$13,510,395.12
Expenses and taxes		8,225,122.27
Net earnings from operations		5,285,272.85
Miscellaneous income		222,765.46
Total earnings and income		5.508,038.31
Fixed charges:		
Rentals of leased companies	$ 650,580.29	
Interest on funded debt of above named companies	2,471,513.99	
Accrued dividends on prefered stocks of affiliated companies held by others than Philadelphia Company	170,456.67	$3,292,550.95
Total income		2,215,487.36
Accrued dividend on preferred stock of Philadelphia Co		224.997.50
Net income—surplus		1,990,489.86
Proportion due to other owners of common stock of affiliated corporations		2,639.17
Available for Philadelphia Company		$ 1,987,850.69

Spokane & Inland Empire Railroad.—The stockholders at a recent meeting voted to change the name of the Inland Empire Railway to the Spokane & Inland Empire Railroad.

Springfield (O.) Street Railway.—At the recent meeting of the stockholders W. H. Stackhouse was elected a director to succeed I. W. Frey. The following officers were elected President, Oscar T. Martin; vice-president, H. J. Crowley; secretary and treasurer, C. L. S. Tingeley; general manager, John H. Miller.

Statistics of Electric Railways in Indiana.—State Statistician Joseph H. Stubbs has issued the following comparative figures for the electric railways in Indiana in 1905 and 1906:

Earnings and Expenses.

	1905.	1906.
Gross earnings	$6,757,730.23	$8,712,775.72
Total expenses	4,679,027.57	5,551,456.50
Gross income	$2,078,702.65	$3,161,319.22

Earnings in Detail.

From passengers	$6,308,653.95	$7,411,093.36
From freight	120,770.37	527,612.05
From mails	3,741.17	24,501.39
From rents	82,033.60	197,492.91
From all other sources	242,531.13	552,076.01
	$6,757,730.22	$8,712,775.72

Expenses in Detail.

Maintenance of way	$ 405,039.43	$ 501,854.07
Maintenance of equipment	369,265.60	558,655.37
Conducting transportation	1,798,928.91	2,517,547.28
General expenses	1,078,236.19	1,260,533.76
Additions and betterments	1,027,557.44	702,866.02
Total expenses	$4,679,027.57	$5,551,456.50

Disbursements in Detail.

	1905.	1906.
Total expenses	$4,679,027.57	$5,551,456.50
Interest on funded debt	2,078,302.01	2,275,831.43
Taxes for Indiana	294,619.00	456,241.70
Taxes other states	55,748.17	....
Rentals	267,001.68	399,460.69
	$7,374,698.43	$8,682,990.32

Miscellaneous.

Passengers carried	112,838,065	127,616,952
Tons of freight and express	33,216	97,571
Miles main trackage operated in Ind.	1,002.19	1,286.73
Miles main trackage owned in Indiana	847.49	1,112.66
Damages	$96,061.30	$166,927.62

Injuries.

	1905	1906
Killed	40	53
Injured	4,346	4,851

Toledo & Western Railway.—By order of Judge R. W. Taylor of the United States circuit court at Toledo, O., this road will be sold at auction on December 5, at Sylvania, O., to meet valid claims of $337,475.70. The road has been in the hands of a receiver, Charles F. Franklin, of Sylvania, since July. It owns 80 miles of road between Toledo and Pioneer, with a branch to Adrian, Mich., and has a capital stock of $1,600,000. Judge C. M. Stone, of Cleveland, is president.

United Railways Company.—Charles W. Tennis, of Cincinnati, O., and others are said to be forming this company to take over the properties of various lines centering at Evansville, including the Evansville & Eastern Electric Railway, the Evansville Electric Railway, the Evansville & Mt. Vernon Electric Railway, and the Evansville Suburban & Newburg Railway. It is stated that options have been secured and that the new company will soon be incorporated with a capital stock of $3,000,000.

Utah Light & Railway Company.—A controlling interest, said to represent about three-fourths of the capital stock of this company, which controls the lighting system and practically all of the street railway lines of Salt Lake City, Utah, has been purchased by interests associated with E. H. Harriman. The principal owners of the property were A. W. McCune, of Salt Lake City, and the Mormon church. Joseph F. Smith, of the church, was president. The capital stock outstanding is $6,062,500, and the bonds amount to 6,350,000.

New directors and officers have been elected as follows: W. H. Bancroft, Heber M. Wells, W. W. Riter, Everett Buckingham, D. E. Burley and Parley L. Williams. Mr. Bancroft was elected president, Mr. Williams, first vice-president, and W. S. McCormick, second vice-president. These men are all connected with the Southern Pacific Company. Work will be commenced at once to rebuild and extend the system.

Windsor & Tecumseh Electric Railway.—This company, which has a road under construction between Windsor, Tecumseh and Chatham, Ontario, has been purchased by the Detroit United Railway and new officers have been elected as follows: President, F. W. Brooks, of Detroit, succeeding C. M. Walker, of Walkerville, Ont.; vice-president and manager, James Anderson; secretary, A. E. Peters, of Detroit; treasurer, Joseph Brampton.

Winnebago Traction Company.—Judge C. M. Webb, of Grand Rapids, Wis., has rendered a decision against the company and in favor of the city of Oshkosh in regard to the right of the company to use a track over the Main street bridge. The company will appeal to a higher court.

Woodbury & Waterbury Street Railway (Waterbury, Conn.)—At a recent meeting of the directors it was decided to build a new trolley line to Lake Quassapaug as soon as possible. It was also decided to merge the Woodbury & Waterbury Company with the Seymour & Woodbury company and operate them under one management.

RECENT INCORPORATIONS.

American Electric Railroad.—Incorporated in Iowa to build a line from Davenport to Muscatine, Winterset, Greenfield and Council Bluffs, which is to be part of a line from Chicago to Omaha. Incorporators: C. W. Baker, president; J. D. Pollard, vice-president and treasurer, and Charles F. Castleman, secretary. Headquarters, Des Moines, Ia.

Ashland & Western Railway.—Incorporated in Ohio to build an interurban line from Cleveland to Marietta, O. Capital stock, $200,000. Incorporators: Z. W. Davis, Isaac H. Taylor, William Simpson, W. L. Stolzenbach, H. B. Stewart. Office, Ashland, O.

Big Creek & Trinity Valley Railway.—Incorporated in Texas to build a railroad from Big Creek to Egypt, Tex , 10 miles. Capital stock, $10,000. Incorporators: J. Ranger, Big Creek; D. W. Kemper, M. O. Kopperl, J. H. W. Steele, Marcellus Kleberg, Jr., E. A. Toebelman, John Neethe, and I. H. Kempner, all of Galveston; S. T. Swinford and B. H. Brown, of Houston.

Buffalo & Lake Erie Traction Company.—Incorporated in New York as a consolidation of the Buffalo Dunkirk & Western Railroad and the Lake Erie Traction Company. This will be a part of the line which the Sheehan-Mayer syndicate, of Buffalo, is building from Buffalo to Erie, Pa. Capital stock $3,900,000. Directors: John W. Shearing, Rudolph W. Yates, Charles H. Werner, Arthur McCausland, James A. Byrne, Peter C. Schutrum, Marshall J. Dodge, William J. Bagnall and Louis B. Grant, all of New York. Mr. Grant is president; Mr. Schutrum, vice-president; Mr. Dodge, treasurer, and Mr. Werner, secretary.

Chicago St. Louis & Kansas City Electric Railway.—Incorporated in Illinois to build an electric line connecting the cities named. Capital stock, $2,500. Incorporators: S. M. McDonald, Thomas W. Kenyon and John S. Corey.

Ft. Wayne & South Bend Railway.—Incorporated in Indiana to build and operate an electric line in Allen, Whitely, Noble, Kosciusko, Elkhart and St. Joseph counties. Capital stock $2,500,000. Principal office at Ft. Wayne. Incorporators: J. H. Grisamer, G. A. Walkup, Charles A. Schorb, E. B. Swift, Perry Randall, W. F. Dinnen, Charles M. Niezer, Val Brown and Fay P. Randall.

Huntsville & Birmingham Electric Railroad.—Incorporated in Alabama to build a road from Huntsville to Birmingham through Marshall, Cullman and Blount counties. Officers: C. S. Briggs, Joppa, Ala., president; L. J. Hanners, of Cullman, vice-president; T. W. Riddle, of Holly Pond, secretary; F. T. Petty, of Huntsville, treasurer and general attorney.

Lake Superior Railway Construction Company.—Incorporated in Ohio for the purpose of building an electric railroad from Marquette to Negaunee, Mich., about 15 miles. Capital stock, $10,000. Incorporators: J. W. Barber, Kit Carson, L. M. Sigler, E. S. Hartman and others.

Missouri Interurban Railway.—Incorporated in Missouri to build a road from Jefferson City to Sedalia, Mo., 39 miles, through the counties of Cole, Moniteau, Cooper, Morgan and Petis. Capital stock, $20,000. Incorporators: J. W. Meller, Sedalia; W. B. Myers, Smithton; J. D. Starke, Soleville; J. H. Gunn, Otterville; W. B. Kerens and A. W. Nelson, Bunceton; Henry Fricke, Prairie Home; F. P. Glendennin, Cedron; B. W. Lansdown, Centretown, and C. W. Thomas, Jefferson City. The road has been surveyed and part of the right of way secured.

North Shore & Western Railway.—Incorporated in Illinois to build an electric road from Evanston to Elgin, Ill. Capital stock, $50,000. Incorporators: W. C. McHenry, William A. Love and E. R. Fifer, of Chicago; H. P. Parsons and George E. Merrick, of Evanston.

St. Joseph Belt & Interurban Railway.—Incorporated in Missouri to build a double track road from St. Joseph through the counties of Buchanan and Andrew to Savannab, 25 miles. Capital stock $1,500,000. Incorporators: John Townsend, D. E. Heaton, Louis Huggins, D. B. Bartlett, J. S. Logan J. H. McCord, J. A. Duncan, Robert Faucett, J. J. Peters, S. S. Brown, J. W. Brockett, and J. E. Dolman, all of St. Joseph.

West Shore Traction Company.—Incorporated in New York to build an electric line from Orangetown, Rockland county, to Piermont, Grand View, South Nyack, Nyack, Upper Nyack, Congress and Haverstraw. Capital stock $2,500,000. Incorporators: Frank J. Whan, A. H. Whan, E. J. Welsh, M. C. Hine, G. P. Fall, G. S. Fulton, of New York; A. S. Brown, Brooklyn; E. G. Roff, Jr., Orange, N. J.; E. A. Hilton, Paterson, N. J.

Winona & Maxinkuckee Railway.—Incorporated in Indiana to build a road from Culver to Warsaw, Ind., via Argos. Capital stock, $10,000. Incorporators: Edwin P. Taylor, Samuel I. Perley, Alexis Coquillard, Virginius Miar and Thomas P. Mordock.

Xenia Cedarville & Jamestown Traction Company.—Incorporated in Ohio to build a railway line between Xenia, Cedarville and Jamestown, O. Incorporators: George Little, Charles Darlington, R. L. Gowdy and others. Office, Xenia, O.

York & Oxford Railway.—Incorporated in Maine to build an electric line from the terminus of the Atlantic Shore Line in Springvale, through Sanford, Shapleigh, Acton, Newfield, Limerick, Parsonsfield, Cornish, Porter, Hiram and Baldwin to Bridgton Junction, 40 miles. Capital stock, $160,000. Incorporators: F. J. Allen, G. W. Hanson, Sanford, Me.; J. M. Ford, Parsonsfield, H. E. Eastman, C. G. Moulton, Limerick; I. H. Moore, A. P. Towle, Newfield; Allen Garner and O. L. Stanley, Kezar Falls.

ROLLING STOCK

Indianapolis & Eastern Railway is reported to have closed orders for new equipment.

Knoxville Railway & Light Company has ordered ten cars from the St. Louis Car Company.

Johnstown (Pa.) Passenger Railway has ordered ten car bodies from the St. Louis Car Company.

Tri-City Railway & Light Company is about to place in service a number of new single-truck cars.

People's Railway Company, Dayton, O., expects to place orders at an early date for new cars.

Lima Kenton & Marion Railway, Indianapolis, Ind., is reported to have ordered six Strang gasoline-electric cars.

Chicago Union Traction Company has ordered 100 double-truck motor cars from the St. Louis Car Company.

Rockford (Ill.) & Interurban Railway has ordered four cross-seat closed cars 52 feet over all for November delivery.

Illinois Traction System has ordered material for two electric locomotives which will be built in the Danville, Ill., shops.

Indianapolis & Western has placed orders for new trucks and motors, but we are not advised as to whether this is for new cars.

Seattle Electric Company is reported as about to close orders for 15 motor cars for delivery next spring and for a number of trailers.

Evansville (Ind.) & Eastern Electric Railway has placed an order with the American Car Company for five double-truck passenger and one express car.

Boston & Northern Street Railway has purchased 50 closed cars from J. G. Brill Company to be built at the works of the G. C. Kuhlman Car Company.

Centralia & Central City Traction Company, which is building a six-mile extension, is reported to have placed contracts for new cars. J. D. P. Francis, St. Louis, Mo., is president.

Stone & Webster, Boston, Mass., has placed an order with the St. Louis Car Company for 52 closed cars for the Puget Sound Electric Railway and the Tacoma Railway & Power Company.

Oregon Electric Railroad Company is in the market for motor cars, trailer cars and electric locomotives. W. S. Barstow & Co., Portland, Ore., are engineers in charge of the construction of this road.

Traction Gas & Electric Finance Company, Buffalo, N. Y., has been reported as about to place orders for 32 cars for interurban service. We are advised that no specifications have yet been prepared.

Beloit Traction Company, which is under construction at Beloit, Wis., by interests identified with the Rockford & Interurban Railway, has ordered four cross-seat closed cars 32 feet over all and four open cars.

East Liverpool Traction & Light Company has purchased ten combination cars from the G. C. Kuhlman Car Company. This equipment was reported early in the year as under consideration for the United Power Company.

Coos Bay Railway & Terminal Company, Henry Hewitt, Jr., president, Tacoma, Wash., is in the market for four 20-foot double controller cars and six miles of 56-pound rail for its line which is projected from Marshfield to North Bend, Wash., six miles.

Birmingham Railway Light & Power Company according to local press statements has ordered 24 cars from the St. Louis Car Company similar to those recently built by the same company. It is stated that 14 of these are for delivery in December and 10 early in 1907.

Indianapolis Traction & Terminal Company ordered early in 1906 50 cars from the Cincinnati Car Company, 20 of which were open cars and 30 closed cars. The open cars have already been delivered and the closed cars it is expected will be completed within a few weeks.

Corinth & Shiloh Electric Railway, which is building a 22¼-mile road from Corinth, Miss., to Shiloh Park, Tenn., is in the market for railroad ties, cars and electrical machinery. W. W. Williams & Co., Nashville, Tenn., have a contract for building, equipping and financing the road.

Conestoga Traction Company has ordered eight single-truck semi-convertible cars 30 feet long, five double-truck semi-convertible cars 40 feet long and five double-truck 40-foot freight cars from J. G. Brill Company for December delivery. The cars will be equipped with 101-B Westinghouse equipments.

Fort Wayne & Springfield Railway, Decatur, Ind., has recently received one express car and three combination passenger, smoking and baggage cars from the Niles Car & Manufacturing Company. This is all the equipment which has been purchased recently and it is not expected that further orders will be placed until 1907.

Milwaukee Northern Railway, Port Washington, Wis., has ordered from the Niles Car & Manufacturing Company eight interurban cars 52 feet long over all and eight city cars 41 feet long over all. The city cars will be of the same type as the standard car for the Detroit United Railways and will be equipped with Christensen airbrakes, four Westinghouse 101-B motors each and Peckham No. 125 M. C. B. trucks. The interurban cars will have Christensen brakes, four Westinghouse 112 motors each and American Locomotive Company's trucks.

Savannah Electric Company is preparing details of four 40-foot removable vestibule semi-convertible cars with two or four motor equipments each. According to newspaper reports reservations of space have already been made with the car builders for this equipment, though we are not advised as to the company receiving the contract.

Marion Bluffton & Eastern Traction Company has received from the Niles Car & Manufacturing Company a work car and an express and baggage car, and has under order with this company five coaches which it is expected will be delivered about November 20. The road is under construction by the Bluffton & Marion Construction Company of Bluffton, Ind., from Bluffton to Marion, Ind.

Metropolitan Street Railway Company, Kansas City, Mo., has ordered 20 cars from the St. Louis Car Company. The electrical equipment will consist of 4 GE-80 motors for each car with type M control. The car bodies are to be 33 feet over corner posts and 46 feet over all. The St. Louis Car Company will furnish trucks for the cars which will be of its 47A design, modified by specifications of the street railway company.

Meyersdale & Salisbury Street Railway is about to complete the construction of its line from Garrett to Salisbury, Pa., running through Meyersdale and Boynton, a distance of 13½ miles, and desires estimates for equipment of four 4-motor 50-horsepower direct-current interurban cars and one freight and express car. Further information can be obtained from W. W. Staub of the Pittsburg & Allegheny Valley Railway Company, 612 Keystone building, Pittsburg, Pa.

Richmond Passenger & Power Company has ordered 20 semi-convertible cars from J. G. Brill Company for January, 1907, delivery. The specifications include the following details:

Seating capacity	43	Length—	
Wheel base	4 ft. 6 in.	Over all	42 ft. 2 in.
Length of body	30 ft. 8 in.	Width—	
		Over all	8 ft. 6 in.

Special Equipment.

Air brakes	Westinghouse	Interior finish	Cherry
Curtain material	Pantasote	Motors—	
Destination signs	Glass	Type	G. E. 90
Fenders	“Proivdence “C”	Number	Four
Hand brakes	14 in. ratchet handle	Safety tread	Stanwood
Heating system	Electric	Sanders	Dumpit
Headlights	Electric	Trucks	Brill 27-G-1

TRADE NOTES

Danville Car Company, Danville, Ill., has been incorporated with a capital of $250,000 by H. F. Vogel, Nic Le Grand and J. A. Swanberg.

Rudolph P. Miller, late chief engineer Bureau of Buildings, New York City, has opened an office as consulting engineer at 527 Fifth avenue, New York.

Lord Electric Company, Fuller building, New York, announces the removal after November 1 of its manufacturing plant and headquarters from Boston to New York.

General Electric Company, Schenectady, N. Y., has an order for four steam turbines of 8,000 kilowatts capacity each, to be built for the New York Edison Company.

National Brake & Electric Company, Milwaukee Wis., has recently furnished a 250-kilowatt, 2,300-volt alternator for the Merchants' Light, Heat & Power Company, of Canton, O.

Mr. H. S. Brown, New England sales manager of the Power Specialty Company, with office at Boston, Mass., sailed recently for a short visit to Europe, to return about November 10.

Wisconsin Engine Company, Corliss, Wis., has appointed as Chicago sales agent, Frank Englehardt, formerly sales agent for the Filer & Stowell Company. His office will be at 735 Marquette building, Chicago.

Eclipse Railway Supply Company, Cleveland, O., has received a duplicate order for 24 Eclipse life guards from the Schenectady Railway, and also a duplicate order from the Kansas City-Leavenworth Railway, Leavenworth, Kan.

Dossert & Co., of New York, announces that it has received notice from its representative in Milan, Italy, that the Dossert solderless connectors exhibited at the Universal Exhibition, Milan, 1906, were awarded a gold medal.

Albert & J. M. Anderson Manufacturing Company, Boston, has appointed R. W. Marshall & Company, 95 Liberty street, New York, agents for the sale of the Anderson line material for electric railways and light and power purposes.

Westinghouse Air Brake Company, Pittsburg, has re-elected George Westinghouse as president and the following directors: George Westinghouse, Robert Pitcairn, H. H. Westinghouse, John Caldwell, E. M. Herr, George C. Smith and H. G. Prout.

B. F. Sturtevant Company, Boston, has recently installed heating apparatus in the repair shops of the New York Central, West Albany, N. Y.; a 12-stall roundhouse for the Southern Railway at Greenville, N. C.; shops of the Haskell & Barker Car Company, Michigan City, Ind., and the new erecting shops of the American Locomotive Company, Schenectady, N. Y. The Locomotive & Machine Company, Montreal, has recently installed in its works Sturtevant mechanical draft apparatus as a substitute for chimney draft. The same is true of the Peoria & Pekin Union Railway; Trinidad Electric Railroad and several other interurban roads.

American Car & Foundry Company has resumed operations at its works at Depew, N. Y., which have been closed for some time. The buildings have been repaired and considerable new machinery installed.

R. W. Marshall & Company, 95 Liberty Street, New York, dealer in electric railway materials, has been appointed eastern agent for the line materials, switchboards and specialties manufactured by the Albert & J. M. Anderson Company of Boston, Mass.

Heath & Milligan Manufacturing Company, Chicago, report that its new factory will soon be in operation and it is expected that this will be the largest and best equipped paint factory in the world. At present the company is using three temporary factories.

D. M. Brady, president of the Brady Brass Company, was tendered a dinner at Sherry's at New York, on Sept. 26, by a large number of his railway and other friends. The toastmaster was H. H. Vreeland, president of the New York City Railway Company.

Power Specialty Company, New York, noting the good results following the establishment of branch offices in Chicago and Boston, on October 1 established a branch office in Philadelphia, in charge of Mr. W. E. Dowd, Jr., with office in the Land Title building.

Allis-Chalmers Company announces that its general offices will be moved within a few days from the Reliance Works at Clinton street, Milwaukee, to the new plant at West Allis and that about January 1 the electrical engineers and draughtsmen now at Cincinnati, will also be moved to West Allis.

Bristol Company, Waterbury, Conn., manufacturer of the Bristol recording instruments and other specialties, has established a branch office at 753 Monadnock building, Chicago, where it will often be able to fill rush orders, particularly for instrument supplies, so as to save several days in delivery.

Edwin M. Hamlin, for several years manager of the railway department of the Lord Electric Company, has resigned his position with that company and will remain in Boston where he has personal business interests. The Lord Electric Company will on November 1 move its head offices from Boston to New York.

Buckeye Steel Castings Company, Columbus, O., will build an extension of 100 feet to its main building and will make an extension of 150 feet to one of its other buildings. It is expected that these extensions will be equipped with heavy cranes and will be used for assembling and storing of couplers and other castings.

Peter Smith Heater Company, Detroit, Mich., owing to its increased business is adding an extension to its factory practically doubling its present capacity. Among the more recent orders is one from the Public Service Corporation of New Jersey for the equipment of 75 cars with the Smith No. 2 B hot water heaters.

Allis-Chalmers-Bullock, Limited, Montreal, has recently furnished 51 induction motors, ranging from 20 down to one horsepower, to the Northern Electric & Manufacturing Company to operate the various machines and tools of its new factory at Montreal. The company reports an unusually large number of orders and inquiries.

James G. Wilson Manufacturing Company, of New York, has recently equipped large car barns for various companies with rolling doors with reciprocating shafts. Among these is the barn of the New York City railway at Forty-second street and North river, and the barn of the Portland Street Railway Company at Westbrook, Me.

Electric Operating Construction Company, 49 Wall Street New York, has been incorporated with a capital of $1,000,000 to manufacture engines, boilers, and railway supplies. The directors are Alfred D. Bowen of San Francisco, W. A. Viele and G. C. Hutchinson of New York, R. S. Masson of Los Angeles and W. D. Beardley of Nyack.

Chicago Pneumatic Tool Company reports that the orders received October 1 to October 25 this year showed an increase of 47 per cent over the same period last year and an increase of 37 per cent over September. The amount of business done for the first nine months of this year has shown an increase of 27 per cent over corresponding period 1905.

David Pepper, Jr., 1233 Land Title & Trust building, Philadelphia, announces the dissolution of the firm of Pepper & Bowie, because of the recent death of John R. Bowie, and states that the business will be carried on hereafter by himself. Mr. Pepper is a well known engineer and contractor and makes a specialty of electric and steam railways, water power, steam and electric plants, etc.

Robert W. Hunt & Company, engineers, Chicago, have been appointed consulting, designing and constructing engineers for the new municipal lighting plant for the city of Milwaukee, by Chas. J. Poetsch, city engineer. This appointment has been unanimously confirmed by the city council, the site for the plant has been purchased, and work will immediately start upon plans and specifications. Estimated cost, $700,000.

T. H. Symington Company, Baltimore, has secured the services of C. R. Naylor, for the past 12 years in the mechanical department of the Atchison Topeka & Santa Fe and at present chief clerk to the superintendent of motive power of that system. Mr. Naylor assumes his new duties on November 1 and will make his headquarters at the western sales office of the Symington Company, 315 Railway Exchange, Chicago.

W. N. Matthews & Bro., St. Louis, Mo., announces that it has recently purchased the rights, patents and good will of the O. K. sleet cutter from Porter & Berg, of Chicago. The readiness with which it can be attached or detached, its indestructibility and the satisfactory way in which it removes the sleet, are the features which have made this sleet cutter so successful during the past five seasons, in which it has been on the market.

Dayton Pneumatic Tool Company, Dayton, O., has doubled the capacity of its works during the past six months owing to the increased demand for Green pneumatic hammers. At the annual meeting of the stockholders on October 16 the following officers were elected: President and treasurer, William W. Price; vice-president, David O. Holbrook; secretary and general manager, F. W. Buchanan; directors, William W. Price, David O. Holbrook, R. E. Condit, G. L. Wagner and F. W. Buchanan.

W. R. Garton Company, Chicago, reports that its business during the month of August was 50 per cent greater than for any previous month. The first half of October it was 30 per cent heavier than September. The company was organized nearly seven years ago to manufacture and sell electric maintenance and construction supplies and each year has shown an increase in the business of at least 50 per cent, with the exception of the last two years which have shown an increase each year of 66 and 70 per cent respectively over any previous year, and from present indications the business during 1906 will be more than double that of last year.

Sterling Cedar & Lumber Company, Charles, Mich., has been organized with $100,000 capital stock, paid in, to deal in lumber for ties, poles, etc., and has purchased 4,000 acres of land in Mackinaw county containing 25,000,000 feet of hardwood, 50,000 cedar poles, 250,000 cedar ties, 250,000 posts and 15,000 cords of pulp wood. The land is located in a favorable position for shipping. The purchase included a saw-mill, camp and outfit and the company has already begun operations. The officers are: President, W. C. Sterling, Monroe, Mich.; vice-president and secretary, W. C. Sterling, Jr., Monroe; treasurer and manager, C. H. Slocum, Bay City; mill and store manager, W. S. Beck, Bay City.

Buffalo Forge Company, of Buffalo, N. Y., reports a large order for a complete forge shop equipment to go to Sumatra. There will be 14 large forges in four different styles or types, suitable for the various classes of work to be performed, the majority of it being large heavy work. All of these forges are to be equipped with the Buffalo down-draft smoke exhaust system. The order furthermore includes the necessary blowers and exhausters for furnishing the blast and removing the smoke, announces the appointment of L. F. Beers as manager of its Detroit office, succeeding H. M. Brightman, who is now connected with the Terry Engineering & Construction Company, of Grand Rapids, Mich.

Crocker-Wheeler Company, Ampere, N. J., reports a number of recent sales among which appear the names of prominent firms who have been using Crocker-Wheeler machines for machine tools, lighting and power, and who are now placing "repeat" orders. Among these sales are included a 500-kilowatt, 250-volt, 125-volt direct current generator for the Pittsburg & Conneaut Dock Company; a 275-horsepower, 220-volt direct current motor and a 325 horsepower, 220-volt direct current motor for the Midvale Steel Company of Philadelphia; three 75-horsepower, 230-volt direct current motors, fourteen 30-horsepower, 220-volt and nineteen 6-horsepower, 220-volt direct current motors for the National Tube Company, McKeesport, Pa.

Refined Iron & Steel Company, Lewis building, Pittsburg, announces the completion of its new plant. The equipment consists of seven double puddling furnaces, three heating furnaces, a 22-inch puddle train, a 16-inch, a 12-inch and a 9-inch train of rolls each furnished and fitted with a vertical boiler furnished by the Bass Foundry & Machine Company, Fort Wayne, Ind. The officials of the company are: President, J. C. DeNoon; treasurer and purchasing agent, I. N. DeNoon; secretary and sales agent, Henry H. Gilg; manager, William Stubblebine, for 35 years superintendent of the Bethlehem Rolling Mills; superintendent, W. A. Stubblebine, for 16 years in the engineering department of the Bethlehem Steel Company.

Westinghouse Electric & Manufacturing Company held the annual convention of its sales managers at the East Pittsburg works during he week ending October 27. The meetings were conducted by E. M. Herr, first vice-president, and L. A. Osborne, second vice-president, assisted by C. S. Cook, manager of the railway and lighting department, S. L. Nicholson, manager of the industrial and power department, C. B. Humphrey, manager of the detail and supply department, and Walter Cary, general manager of the Sawyer-Man Electric Company. On Wednesday evening, October 24, the officials of the company gave a banquet to the visiting managers at Hotel Schenley, at which there were present, in addition to the officials and managers of the electric company, prominent officials of associated interests, including H. G. Prout, vice-president of the Union Switch & Signal Company; Jno. F. Miller, fourth vice-president of the Westinghouse Air Brake Company, and E. H. Sniffin, third vice-president of the Westinghouse Machine Company. These annual meetings were inaugurated a number of years ago and give an opportunity for the interchange of ideas of the managers from all parts of the country, working under almost every known commercial condition. The convention closed on Saturday, when the managers returned to their respective territories.

ADVERTISING LITERATURE

Crocker-Wheeler Company, Ampere, N. J.—Bulletin No. 69 describes an especially arranged generator for direct connection to steam or gas engines.

American Conduit Company, 336 Macey Street, Los Angeles, Cal.—A four-page circular regarding bituminized fiber conduit for underground electrical work.

American Engineering Company, Indianapolis, Ind.—Circular showing steam and electric railway work recently undertaken by this firm of engineers and contractors.

Westinghouse Traction Brake Company, Pittsburg.—Motor-driven air compressors, type D, form EG., are illustrated and described in a 24-page bulletin recently issued.

Allis-Chalmers Company, Milwaukee, Wis.—Bulletin No. 1508 is devoted to the interests of the air brake department and is a 12-page leaflet describing Christensen air brake equipment.

B. F. Sturtevant Company, Boston, Mass.—Bulletin No. 139 presents a full line of generating sets driven by direct-connected vertical enclosed engines with forced lubrication. All are designed especially for generator driving.

Dayton Pneumatic Tool Company, Dayton, O.—Circular illustrating and describing Green pneumatic hammers. It is stated that more than 500 of these hammers have been installed by one concern alone in the past 12 months.

Whiting Foundry Equipment Company, Harvey, Ill.—Catalogue No. 47 has 16 pages and describes ladles for all classes of work. Catalogue No. 48 describes direct current solenoid brakes. Each is 6 by 9 inches and has a perforated back for binding.

Western Electric Company, Chicago.—"Hawthorne Works" is the title of a well illustrated pamphlet describing the works of the company and designed to call attention to the fact that the company is in a position to build a heavy power apparatus.

Buffalo Forge Company, Buffalo, N. Y.—Leaflets describing the Buffalo compressed air forge which is said to be meeting with exceptional favor among structural steel contractors, bridge contractors, etc. Also a leaflet describing a Buffalo No. 200 geared hand blower.

Electric Storage Battery Company, Philadelphia, Pa.—Bulletin No. 101 is entitled "The Application of Storage Batteries to Railway and Lighting Stations," and describes the installations of chloride accumulators for the Columbus Railway & Light Company, Columbus, O.

Derry-Collard Company, 109 Liberty Street, New York.—This company is issuing a Practical Paper Series, at a uniform price of 25 cents each. No. 5 is entitled "Brazing and Soldering," by James F. Hobart. It has 22 pages of practical information and 16 pages of illustrations.

Ohio Brass Company, Mansfield, O.—A small pamphlet of 16 pages calls attention to the car equipment specialties handled by this company including the Nichols-Lintern air sander, the Aikman pressure annunciator, the Tomlinson car coupler, bell metal and babbitted motor bearings and other equipment.

American Henderson Roller Bearing Company, 649 Railway Exchange, Chicago.—Booklet No. 1 has 16 pages and cover, 6 by 9 inches, and describes the Henderson roller bearing as used on street and interurban railways. Testimonials are published from several roads who have used these bearings on their equipment.

Quincy, Manchester, Sargent Company, Old Colony, Chicago.—This company is mailing to its friends an eight-page card describing the Quincy, Manchester, Sargent, or Cafferty tie tool, which is expected to reduce the cost of track work and save new ties from damage by pick puncturing. This tool is 33 inches long and weighs ten pounds.

Adams & Westlake Company, Chicago.—A handsome catalogue of 78 pages, 9½ by 7½ inches, devoted almost entirely to headlights for steam and interurban railways. The company is a well known manufacturer of headlights, signal lamps, lanterns and car trimmings of all descriptions. The catalogue is printed on enameled paper, with blue ink, and has an index.

Atlas Engine Works, Indianapolis, Ind.—Two pamphlets, 8 by 10 inches, illustrating and describing medium speed automatic four-valve engines and throttling and automatic single valve engines. Each has 16 pages and detailed information concerning the subject mentioned. The company states that it builds the most complete lines of engines and boilers of any concern in the world.

Ingersoll-Rand Company, 11 Broadway, New York.—"The Little Jap" hammer drill is the title of bulletin No. 2011. The hammer drill is becoming as indispensable for the lighter work of all rock excavation as is the heavier piston drill for heavier service. The drill described in this leaflet is a standard machine of this class and its construction, operation and peculiar uses are fully presented.

Sprague Electric Company, New York City.—Catalogue sheet, pages 220-12 G and 12 H, illustrating a grab bucket for mono-rail crane. With this device the opening and closing of the bucket and the lifting and lowering of the bucket are accomplished by a single controller and two electric motors; one motor is used to open and close the bucket and both are used to lift and lower the load. The advantages claimed for the device are that the controller may be mounted any place regardless of the location of the hoisting bucket, that the operator has only one handle to manipulate and that the motors are running only when lifting or lowering the bucket or opening or closing it.

W. T. Van Dorn Company, 1076 South Paulina Street, Chicago.—A catalogue of 32 pages, 9 by 7 inches, illustrating and describing the Van Dorn automatic coupler. The catalogue states that Van Dorn appliances are in use on the elevated roads of Chicago, New York, Brooklyn, and Boston, in the New York subway, on the Long Island railroad, Indianapolis & Northeastern Interurban and other prominent roads.

Solid Steel Tool & Forge Company, Brackenridge, Pa.—A four-page circular describing knuckle pins. These are carried in stock to fit all standard couplers. The circular states that these pins are three times as stiff as common ones and stand three times as many bends back and forth. They are as strong as tool steel and as hard to break as good iron. The company manufactures car forgings, track tools and drop forgings.

Detroit Graphite Manufacturing Company, Detroit, Mich.—This company has just issued a little book entitled "Serviceable Paints for Particular Places." It is the size of a postal card and has a clasp which keeps the book closed while in the mail. The cuts shown are halftones printed upon tinted paper. The cover is printed with black ink and the rest of the reading pages with brown and blue ink, making a very neat effect.

Narragansett Machine Company, Providence, R. I.—Catalogue G4 is a well printed publication with a handsome embossed cover calling striking attention to the product of this company, which includes lockers for factories, gymnasiums, offices and similar purposes. The catalogue contains a list of stock sizes and a description of parts, locks, benches and other accessories. The lockers described include various types of steel lockers and expanded metal and other doors as well as the familiar wood locker.

Commercial Acetylene Company, 80 Broadway, New York.—"The Solution of the Lighting Problem" is the heading of a new 32-page pamphlet 8½ by 10½ inches, describing the acetylene safety storage system for railway lighting and other purposes. A similar pamphlet entitled "The Light that Never Fails" has 16 pages, 9 by 7 inches. Each is printed on enameled paper and filled with excellent illustrations showing in detail the application and operation of this system of lighting. The latter pamphlet has several pages of testimonials.

Boston Belting Company, Boston, Mass.—In a pamphlet entitled "Some Comments on Air Brake Hose," James Bennett Forsyth, general manager, calls attention to defects in the tests upon which was founded the report presented to the recent Master Car Builders' convention, in that no distinction was made in samples of hose manufactured to 1903, 1904 or 1905 specifications, all being tested under 1903 specifications which are much more severe than those of the other years, under which specifications hose is manufactured and sold at from 20 to 40 per cent less than that made to 1903 specifications.

Chicago Pneumatic Tool Company, Chicago.—Catalogue No. 20 is a book of 116 pages devoted exclusively to a detailed description of Franklin air compressors manufactured at the Franklin plant. It presents a full detailed descriptive list of over 100 sizes and styles of Franklin air compressors, constructive principles are presented in full and information not hitherto published is given relative to several new types of compressors including Corliss, motor driven and gas engine driven. Considerable space is given to pumping by compressed air and numerous interesting tables and formulae complete the contents of the publication.

General Electric Company, Schenectady, N. Y.—Transformers, type H, are described in a pamphlet of 20 pages and cover. Bulletin No. 4456 is devoted to wrought copper cable terminals; No. 4457, parts of form B arc headlight; No. 4459, feeder regulators; No. 4460, parts of form 3 luminous direct constant current series enclosed arc lamp, with stationary upper electrode; No. 4461 GE-78 railway motor; No. 4462, variable speed direct current motors with commutating poles; No. 4463, carrier bus arc panels for brush arc generators; No. 4464, polyphase induction motors. These are all printed on coated paper, 8 by 10½ inches, filled with halftone illustrations and each has 8 to 24 pages.

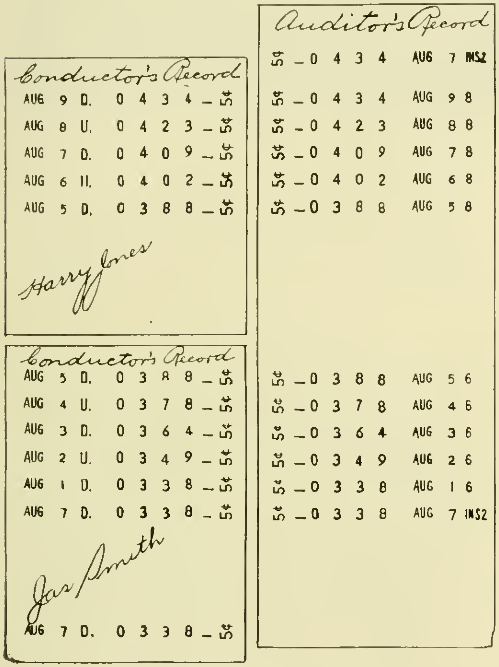
Keystone Brake Shoe Co., New York City.—This company has issued a catalogue handsomely bound in calf-skin, of the Keystone brake shoes and heads. The Keystone shoe, which is an invention of V. B. Lamb and has been patented by him in the United States and foreign countries, has but recently been placed upon the market. It is designed to eliminate all scrapping of worn shoes and to fit any make of brake head, the shoe being held nearly its entire length by a tapering keystone tenon instead of by a lug in the middle. The shoe and the head especially designed for use in connection with it are particularly adapted to service on electric railways but are made for both steam and electric traction service.

Joseph Dixon Crucible Company, Jersey City, N. J.—This company is distributing a pamphlet of 32 pages entitled "Steam Traps," being an illustrated description of the several varieties, with valuable suggestions, by W H. Wakeman. Most of the matter in this pamphlet had previously appeared in "Graphite" the house organ of the company. The tenth edition of "Graphite as a Lubricant" has just been issued. This has 84 pages, 6 by 9 inches. Although published as advertising literature there is a large amount of valuable information in the book and this is made easily accessible by a carefully prepared table of contents. A 16-page booklet has also just been issued by the company entitled "Air Brake Lubrication" with a description of the properties and uses and special advantages of Dixon's Ticonderoga graphite air brake and triple valve grease and Dixon's special graphite No. 635.

TWO NEW RECORDING REGISTERS.

Mr. John F. Ohmer has recently invented two new recording registers, and the Ohmer Fare Register Company, of Dayton, O., is manufacturing the new machines, which will be known as Nos. 19 and 20.

The Ohmer duplex register No. 20 is especially designed and manufactured for large city heavy traffic properties. It is a one-fare recording register, and prints a record of all the fares collected on each trip. With each printed record is combined a record of the direction in which the car moves, the register number, the trip number, the month and day, the identification of the conductor, and a record of the denomination of the fare which is registered, as, for instance, 5 cents or transfer. The machine comprises, in addition, the total counting passenger or trip wheels and visible indicators, showing the direction. It is necessary to turn the trip wheels to zero at the end of each trip, to change the direction indicator and direction printer, and by so doing the machine is locked until the record of the fares collected on the previous trip is recorded in duplicate. The machine has two compartments, into each of which is fed a duplicate copy of the record. The conductor has access to one compartment, from which, at the end of his run, he removes his individual record, which is turned in to the cashier with his collections. The other record remains in the machine and is accessible only to the inspector or duly authorized agent, who is given a key to the private compartment. Each succeeding conductor removes his own record and at the finish of the day the auditor's record is removed. This record shows a duplicate in detail, by the trip, for the several conductors who operated the car for the day, and it can be compared with the several individual conductors' records for auditing the cashier's record, to whom returns are made by the conductors.



Conductor's Record

AUG 9 D. 0 4 3 4 — 5¢
AUG 8 U. 0 4 2 3 — 5¢
AUG 7 D. 0 4 0 9 — 5¢
AUG 6 U. 0 4 0 2 — 5¢
AUG 5 D. 0 3 8 8 — 5¢

Harry Jones

Conductor's Record

AUG 5 D. 0 3 8 8 — 5¢
AUG 4 U. 0 3 7 8 — 5¢
AUG 3 D. 0 3 6 4 — 5¢
AUG 2 U. 0 3 4 9 — 5¢
AUG 1 D. 0 3 3 8 — 5¢
AUG 7 D. 0 3 3 8 — 5¢

Jas Smith

AUG 7 D. 0 3 3 8 — 5¢

Auditor's Record

5¢ — 0 4 3 4 AUG 7 INS2
5¢ — 0 4 3 4 AUG 9 8
5¢ — 0 4 2 3 AUG 8 8
5¢ — 0 4 0 9 AUG 7 8
5¢ — 0 4 0 2 AUG 6 8
5¢ — 0 3 8 8 AUG 5 8
5¢ — 0 3 8 8 AUG 5 6
5¢ — 0 3 7 8 AUG 4 6
5¢ — 0 3 6 4 AUG 3 6
5¢ — 0 3 4 9 AUG 2 6
5¢ — 0 3 3 8 AUG 1 6
5¢ — 0 3 3 8 AUG 7 INS2

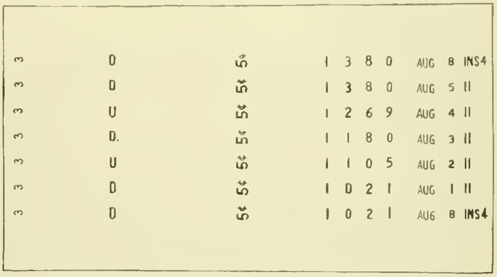
New Recording Register—Duplicate Record from Type No. 20.

The accompanying illustration shows that inspector No. 2 opened the record with 338 on August 7; Conductor Smith (identification No. 6) took the first trip out. He made four half trips. Conductor Jones (identification No. 8) succeeded at the beginning of the fifth trip, his opening record, 388, being the closing record for Smith. The closing record for Jones is 434. The detail work for each conductor is duplicated on the auditor's record. Each conductor signs the record which is removed by him, and the duplicate auditor's record is identified by the conductor's badge number.

The advantages of having the work of each conductor registered and recorded in duplicate are many and will be readily appreciated.

Register No. 19 is the same in outward appearance as No. 20, but is different in operation, in that the duplicate record feature is omitted. The machine cannot be operated unless the conductor or other responsible person in the car has inserted his identification key, from which is printed his number, together with the opening number of the register. At the end of each half trip, the trip wheels should be turned to zero, which operation reverses the direction indicator as well as the direction printer. The operation of turning the trip wheels to zero locks the machine, and it remains locked until a printed record has been taken of the fares collected on the preceding trip. The conductor is therefore compelled to turn the trip wheels to zero in order to reverse the direction indicator the direction printer, and this insures a printed record of the fares collected.

Attention is directed to the adjoining copy of a record from this register. It shows that 5-cent fares have been registered. Inspector 4 took the opening and closing record on August 8 and conductor 11 operated two round trips. The record sheet in this machine is accessible to the conductor, or excluded from him, at the option of the company.



3 D 5¢ 1 3 8 0 AUG 8 INS4
3 D 5¢ 1 3 8 0 AUG 5 11
3 U 5¢ 1 2 6 9 AUG 4 11
3 D. 5¢ 1 1 8 0 AUG 3 11
3 U 5¢ 1 1 0 5 AUG 2 11
3 D 5¢ 1 0 2 1 AUG 1 11
3 D 5¢ 1 0 2 1 AUG 8 INS4

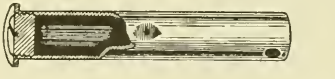
New Recording Register—Record from Type No. 19.

Each record roll of paper will run a machine thirty days or longer.

AN AUTOMATIC LUBRICATOR FOR TROLLEY-WHEELS.

The Richardson automatic lubricator for trolley-wheels, illustrated herewith, is manufactured by the Richardson Automatic Lubricating Company, of Leavenworth, Kan., and is being placed on the market by the Recording Fare Register Company, of New Haven, Conn.

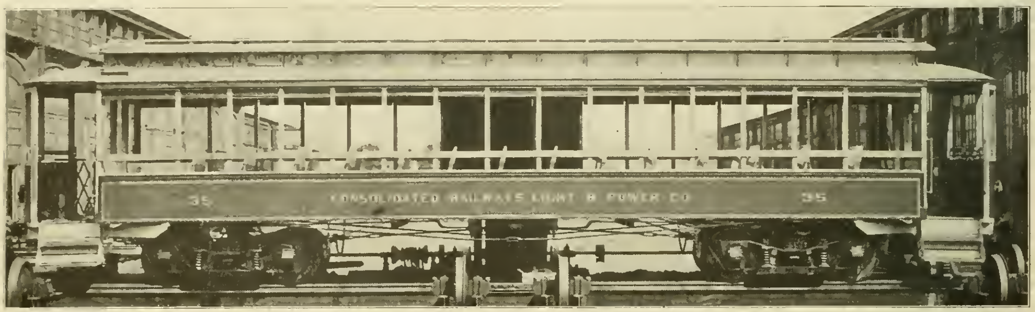
This lubricator is in the form of a cotter-pin or spindle to be inserted in the harp with the oil-hole opening on the journal. It operates on a new principle, employing the automatic expansion of air for the feeding force to a solidified lubricant of any standard grease, which should be a No. 3 for summer and a No. 2 for winter use. The lubricator is filled with a loader or syringe two-thirds or three-fourths full so as to leave an air space. The threads should be covered with grease so that when the plug is screwed in it will make an air-tight joint. The pin is then inserted from the right-hand side of the harp facing the trolley-wheel, with the back to the butt of the pole or trolley stand, when the cotter-pin is parallel with the pole, and from the left-hand side when the cotter-pin is horizontal, as the oil hole must be down. As the wheel revolves, assuming that the journal is not lubricated, its frictional engagement with the pin quickly raises the temperature of the latter and as a result that of the air in the pin. The air expands and exerts sufficient pressure on the oil to force a small quantity of the latter downward through the oil hole, whence through the action of the wheel it spreads and lubricates the entire surface of the journal, it being understood in this connection that the heat generated by friction is never sufficiently great to melt the solidified oil. The lubrication of the journal eliminates friction between the wheel and pin, and is of course shortly followed by a fall in the temperature of the air. The air contained within the pin or spindle contracts, and a partial vacuum exists within the pin. Therefore there is an excess of pressure on the outside of the spindle, and the air from the outside rushes into the spindle through the lubricating orifice to establish an equilibrium between the pressure inside and outside the pin, and this volume of air admitted to the spindle is proportionate to the volume of the lubricant ejected, so as to restore the air within the pin to normal or atmospheric pressure, that it may under a second slight rise in temperature again expand and expel solidified lubricant from the pin or lubricator. This action is repeated until the lubricant is exhausted.



Automatic Trolley Wheel Lubricator.

The advantages claimed for this lubricator are that no rebushing of wheels is necessary; that it will thoroughly lubricate a wheel on any road from one thousand to three thousand miles; that it is absolutely clean; that no grease will fall from the trolley to the ground or the bonnet of the car; that there is less tendency of the wheel to arc and slip on the overhead, as wear on the journal bushing is hardly appreciable, which prevents the wheel from wobbling, and causes it to ride the wire better than wheels with worn bearings; that the wear on a spindle is three or four times as long as on a solid spindle lubricating in the old way; that it saves cost of bushing; increases life of wheels; reduces cost and care of attention to lubricator, as one filling of the oiler is sufficient for from 10 to 20 days, according to service.

NEW EQUIPMENT FOR THE CONSOLIDATED RAILWAYS LIGHT & POWER COMPANY, WILMINGTON, N. C.



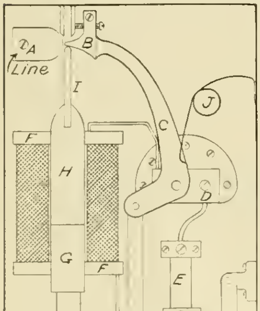
Open Car for Consolidated Railways Light & Power Company, Wilmington, N. C.

The J. G. Brill Company has recently delivered to the Consolidated Railways Light & Power Company of Wilmington, N. C., a number of cars similar to the type illustrated. These cars correspond to those supplied previously by the John Stephenson Company, one of which is shown in the illustration, excepting that they are of shorter dimensions, the cars of the present order measuring 40 feet 6 inches, while the earlier cars were 50 feet in length. Practically the entire equipment for this road has been furnished by the two builders mentioned and in addition to 15-bench open cars built by the John Stephenson Company and the types mentioned, 20 feet 8 inch-single-truck Brill semi-convertible cars are operated; these latter cars are used on the five miles of city line and the big double-truck cars which are equipped with multiple-unit switch control are operated over the 12-mile interurban line to Wrightsville Beach, a popular coast resort.

The Brill cars recently delivered measure 40 feet 6 inches over the vestibules; width over sills, including sheathing, 8 feet 4 inches. It will be seen that the car has no sash in the window openings; there are drop sash, however, in the bulkheads on each side of the door and the vestibules are equipped in a like manner, the center sash in the latter compartment being provided with stops to hold the windows at any height desired. There are no doors, curtains being utilized in their stead during inclement weather. The seats, which are of the builders' manufacture, are 36 inches wide, permitting of an aisle space of 24 inches; the type of truck is the Brill 27-E1 with a wheel-base of 6 feet 2 inches.

A NEW LIGHTNING ARRESTER.

A new lightning arrester of the circuit-breaker type is being placed on the market by the Oleson-Williams Company, of Toledo, O. From an examination of the accompanying diagram it will be seen that the block A is connected with the trolley circuit. Between this block and the block B, which is mounted on the movable arm, C, is an air-gap, the length of which may be regulated. The lightning discharge is offered a ready path to earth through these parts and the graphite resistance plug, E. If the lightning discharge is greater than the carrying capacity of the graphite resistance plug, the excess is shunted across points approaching each other immediately under the graphite from the brass holding blocks. When the graphite is taxed to its carrying capacity, the easier path for the lightning discharge is across the points, thus preventing the graphite from becoming charred or burned and putting a splendid insulator in the place where only a certain ohmic resistance was intended. In this manner the efficiency of the graphite resistance plug is preserved. The graphite used is of sufficiently low ohmic resistance as to shunt just enough of the dynamic current through the solenoid, F, to magnetize it and pull up the core, G, which is mounted on the wooden pin, H. By means of proper leverage, this action throws back the pivoted arm, C, increasing the arc. At the same time, a slide, I, of incombustible, insulating material mounted on the upper end of the pin, H, and just uncovering the block, A, moves up and takes its place in front of the block, A, thus cutting the arc as nearly instantaneously as possible. A spring, J, is so placed that its tension will become greater as the arm is thrown back, thus insuring a positive resetting of the air-gap after the arc is broken.

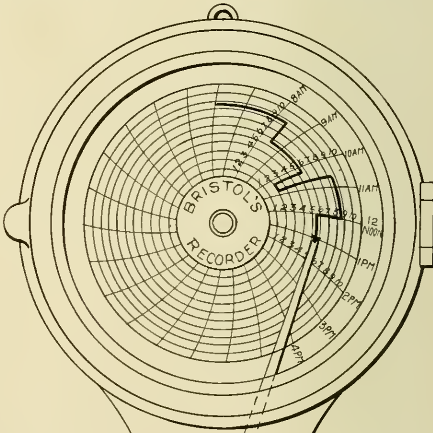


Oleson-Williams Arrester —Diagram of Wiring.

The stated advantages of this device are the free path to earth offered to the static charge, the quick break of the dynamic arc outside of any inclosure which may become clogged by the confined heat, the method of preserving the efficiency of the graphite resistance plug and the automatic action requiring no attention.

MECHANICAL TIME RECORDERS.

An instrument for permanently recording on a chart the time at which various operations take place has recently been developed by The Bristol Company, Waterbury, Conn. The new "Mechanical Time Recorder" consists of a clock movement which is enclosed in a case similar to that of a recording pressure gauge and which revolves at a uniform speed a disc carrying a chart laid off in radial co-ordinates. A pen arm is rigidly attached to a shaft in the lower part of the case. This shaft is turned by a short arm projecting through a slot in the bottom of the case. By means


BRISTOL'S RECORDER
8AM
9AM
10AM
11AM
12 NOON
1PM
2PM
3PM
4PM
Maximum Movement At 14" = 5"
Clamped Joint
Arm may be located anywhere in this half circle
Adjustable From 2" to 14"

The Bristol Mechanical Time Recorder.

of a clamp with a thumb nut the length of this lever is adjustable. The clamp also serves for connecting the instrument with a reducing mechanism. As the circular chart driven by clock work revolves at a uniform speed while the pen moves over the chart in an amount proportional to the motions which are being recorded, a curve is drawn affording a permanent record of the time at which these movements occur and the relative amplitude of the movement being observed.

The charts used are 8 inches in diameter and are laid off in co-ordinates with units of time as abscissae and uniform speeds numbered from 1 to 10 as ordinates. Clock movements can be supplied which will revolve the chart once in ¼, 1, 2, 3, 4, 6, 8, 10, 12 or 24 hours or 7 days. It is thus seen that a speed may be selected which will give the best results for the particular conditions under which the recorder is to operate. By means of a reducing gear and the adjustable connecting clamp the instrument is adapted for conveniently recording motions of varying amounts and directions. The total deflection of the pen is obtained by turning the connecting lever through an angle of about 21 degrees, which corresponds with the movement of 5 inches at the outer end of the lever.

It is suggested that mechanical time recorders may be found valuable in obtaining permanent records of the rate of motion and position of sluice gates, turbine or engine governors, gate valves and also for recording the rise and fall of liquids in tanks, rivers, reservoirs or in general hydraulic work.

STORAGE BATTERIES AND BATTERY PLATES.

The storage battery is today an important and essential part of a complete power plant. The advantages of a properly designed, properly installed storage battery appear in three distinct phases: First, mechanical, as maintaining virtually uniform loads upon generating equipment, enabling engines to be operated at the point of highest efficiency; second, electrical, as maintaining electrical pressures over long lines, despite fluctuation, and likewise as preventing electrical losses due to carrying large volumes of current over limited conductors; and third, financial, as a result of the other two gains, showing as a smaller investment and lower cost of kilowatt output.

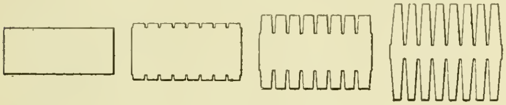


Figure 1—Storage Battery Plates.

Batteries for general power service are of three distinct types; the regulating battery, the floating or line battery, as used chiefly on street railway lines; and the boosted line battery.

The regulating battery is always installed in connection with a booster through which all current flows, both on charge and discharge. The essential function of the booster battery is to neutralize fluctuations, charging when the current demand is light, discharging when the current demand increases above a predetermined point, thus maintaining a practically uniform load upon the generating equipment. During hours of very light load the engines may be entirely shut down and the battery furnish all power required.

The line or floating battery has no booster or other charging equipment. It is simply connected across the circuit at points distant from the power house where the pressure drop under fluctuations is considerable.

When the current demand is light the electromotive force of the line exceeds that of the battery and current is absorbed. When the current demand causes the line pressure to drop below the electromotive force of the battery discharge takes place, so that voltage fluctuations are minimized. The boosted line battery as used on long lines entails the erection of a separate feeder line direct to the battery, the voltage of which is raised by a booster in the power station to any necessary extent above the line voltage to compensate for drop. This provides one auxiliary service of supply to the battery.

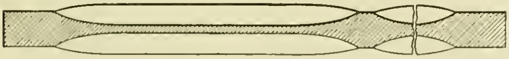


Figure 2—Storage Battery Plates.

There are two distinct economies in line batteries: first, the savings on cost per kilowatt delivered due to the elimination of large voltage losses on a given amount of current transmitted, and second, the smaller investment in copper conductors required to transmit the extreme ampere demand within the limits of allowable voltage drop. It is a fact too little appreciated that the first cost of a line battery is often very much less than that of copper feeders sufficient to secure anything like equivalent effect. As evidence of the extent of these economies it is stated that the line batteries installed by the Gould Storage Battery Company have frequently saved their entire cost in less than eighteen months.

The battery plate is the controlling factor determining the efficiency, the capacity, endurance, and life of any storage battery. The requirements of lead storage battery plate as given by Lamar Lyndon, M. E., in "Storage Battery Engineering," are substantially as follows:

1. Uniform resistance throughout grid to secure even current flow through all portions of active material.
2. Allowance for expansion and contraction of active material during discharge and charge.
3. Close electrical contact between active material and support plate.
4. Freedom from local or secondary action.
5. Provision for ample circulation of acid electrolyte.
6. Large surface of active material exposed to electrolyte.

The following brief description of the Gould battery plate and the accompanying illustrations serve to explain to how great a degree this plate fulfills the theoretical requirements as set forth above.

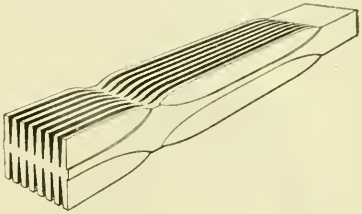


Figure 3—Storage Battery Plates.

The Gould plate is of the plate type, so-called, in which the active material—lead peroxide (Pbo O.) of the positive and spongy lead (Pb) of the negative—is formed electro-chemically out of the lead composing the support plate or contact surface. Figure 1 shows a fragment of a Gould plate illustrating the manner in which the large contact surface for active material is developed out of a sheet of rolled lead cut to the size and shape of the plate. This "blank" is placed between two shafts on which are mounted sets of rapidly revolving steel discs with spacing washers. These discs are pressed against the plate and moved to and fro, working into the lead further and further and spinning the metal between the knives up into thin parallel ribs. Figure 2 is a longitudinal section of a fragment of a plate, and shows the web of metal left as a central conductor and also the diamond-shaped cross-conductors and current-distributing bars. Figure 3 is a perspective drawing of a small fragment of finished plate and very clearly indicates the character of the construction. The active material is formed out of the lead composing the contact surface between the ribs, filling the spaces with closely packed but highly porous active material. Expansion and contraction cannot cause loosening or falling out of the active elements and the closest electrical contact is preserved. Figure 4 shows the double conducting lug by means of which better distribution of current is secured.

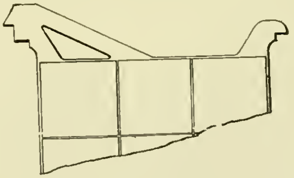


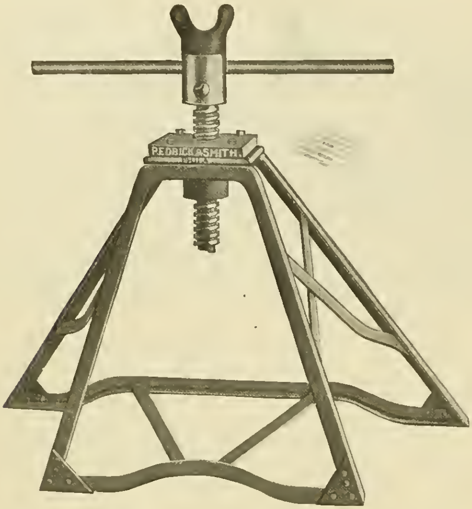
Figure 4—Storage Battery Plates.

Only chemically pure, densely-rolled lead is used, so that secondary actions leading to "self-discharge" are therefore impossible. The Gould plate is absolutely integral; no lead is removed or added in making the plate, the blank is merely changed in form. The ample provision for circulation of electrolyte and the large contact surface presented for securing high efficiency and long life. In addition to batteries for power purposes the Gould Company is manufacturing types for telephone, telegraph and signal service, for train lighting and electric vehicles.

JACKS FOR CABLE REELS.

The ingenious jack shown in the accompanying engraving meets a marked need in the field of its intended use, as the devices heretofore available for handling cable drums in connection with laying underground cables have been for the most part heavy, clumsy and unsatisfactory in service. The structural steel screw capstan cable jack shown is manufactured by Pedrick & Smith, Germantown, Pa. This device is light and easily portable, yet strong and rigid; the weight of the jack is only 60 pounds, but when supporting the heaviest cable drums it shows no vibration. Steel angles strongly braced combine strength with lightness.

The jacks are used in pairs, one on each side of the cable drum, which rotates on an axle. The illustration shows the jack from the drum side, the narrower A-frame being next to the drum. The inner support is constructed so as to take up as little room as possible and has very little slant toward the drum, only 1½ inches from perpendicular. This adds strength as it allows the drum to revolve close to the supporting jacks. The spread of the inner support is 14 inches, which does not interfere with the man operating the drum. This also permits placing the drum nearly over the manhole or aperture in which the cable is being laid. The bracing effect is in the outer support, the slant of which from the drum is 5½ inches from perpendicular, and the spread 36 inches; toppling in any direction is thus prevented. The screw has a heavy thread and is of a pitch designed to elevate the drum rapidly with little effort. The standard jack elevates from 28 to 36 inches.

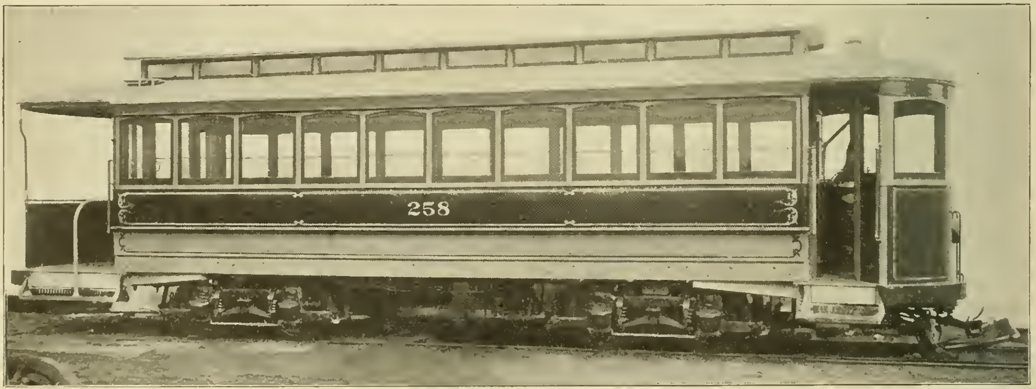


Screw Jack for Cable Reels.

NEW CLOSED CARS FOR OMAHA, NEBRASKA.

The car illustrated herewith is one of 20 which the American Car Company has lately delivered to the Omaha & Council Bluffs Street Railway Company. The distinctive feature is the arrangement of the forward vestibule, in which is built a stationary motorman's compartment, access to which is gained by an ordinary swing door. The sliding door to the side which admits one to the passenger compartment, is of the Brill semi-accelerator pattern, the longitudinal seat opposite extending only far enough to permit of a comfortable passageway. In the motorman's compartment will be noted the hot water heater. The platform at the rear end is of the "Detroit" type which makes a systematic disposition of passengers entering and leaving the car. Push buttons are located at each post and window screens are provided on the one side only as the cars will be operated in but one direction. Interiors are of cherry; ceilings of quartered oak; the window system is the ordinary drop-sash arrangement. The important dimensions are: length over end panels 28 feet and over vestibules 39 feet; width over sills including sheathing 7 feet 6 inches; height from floor to ceiling 8 feet 2¼ inches. Two motors of 40 horsepower capacity each were installed on each car. The weight of car and trucks including motors is about 20,000 pounds.

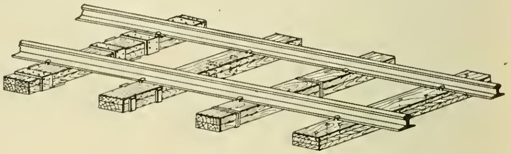
Omaha is steadily growing in size and population and each year the railway company has found it expedient to add from 20 to 30 cars to the equipment to keep pace with the increased travel. The railway company has been actively engaged with improvements to its system and since the completion of the 50,000 kilowatt power house, two modern brick car houses and very complete car repair shops, is in a better position than ever to take care of its patrons.



New City Car with Motorman's Compartment and Detroit Platform, Omaha & Council Bluffs Street Railway Company.

A BUILT-UP TIE.

Mr. Israel Hogeland, 508 Reaper Block, Chicago, who some years ago invented a noiseless carwheel made up of hub and tire sections with paper interposed, is introducing a tie composed of two, three or four longitudinal sections. The purpose is to enable the use of smaller pieces of tie timber and also to secure a certain additional flexibility in the complete tie.



A "Built-Up" Tie.

The accompanying illustration shows the several ways in which the tie may be built up as well as various methods of fastening the sections together. As shown, the necessary sectional dimensions may be obtained by uniting two comparatively thin ties one upon the other and fastened by spikes, or by combining three or four smaller sections by means of clamps. It is understood, of course, that the faces of the sections which in the complete tie are adjacent to each other must be prepared to fit—by sawing or hewing smoothly—and it is suggested that a waterproof protected packing be interposed between the sections. Mr. William E. Halm, assistant superintendent of the Chicago Consolidated Traction Company, states that he is well pleased with the tie, not only on account of the saving of timber and the fibered seams, but on account of its flexibility and noiselessness, affording relief to wheels, cars and passengers. He suggests a filling of ⅛-inch or more of tarred roofing paper or asbestos for deadening purposes.

VOLTAX FOR INSULATING AND WATERPROOFING.

Electric Cable Company, 17 Battery Place, New York, reports receipt of further orders from the New York Central for Voltax, a liquid compound to be used as insulating and waterproofing material in connection with the third rail system near High Bridge, New York. Among the large concerns which are using Voltax for this purpose are Westinghouse Church Kerr Company, who are using it on galvanized cables; the Interborough Rapid Transit Company, who are using it as a waterproofing material on their galvanized sheds and out-houses; and the American Insulating Machinery Company of Philadelphia, who are using it on the frame work of their insulating machines.

Electric Railway Review

PUBLISHED MONTHLY BY THE WILSON COMPANY, CHICAGO

NEW YORK: 150 Nassau Street CHICAGO: 1660 Monadnock Block PITTSBURG: 510 Frick Building

Subscription Price, $1; Foreign, $3; Single Numbers, 10 cents Entered at the Post-Office, Chicago, Ill., as Second-class Matter

VOL. XVI DECEMBER, 1906 NO. 12

Index of the Review for 1906.

The present year has seen a marked change in this journal. Beginning with the July issue, under new management, the name was changed to the Electric Railway Review, which was thought to be more comprehensive. Since that time the increased editorial and news-gathering resources have shown themselves in the character of each of the monthly issues, and the attractive daily issues. It has been attempted to make each number of the Review as widely useful as possible by including articles touching upon subjects in nearly all of the general departments of an electric railroad organization. The daily issues this year were by far the most satisfactory that have ever been published and contain all of the many valuable papers and discussions of the Columbus conventions. With the change in ownership the size of the pages was made 9 by 12 inches. As the Review is issued monthly and has always been published with pages numbered for binding the twelve monthly issues and the daily issues as one volume it was not thought wise to break in upon the former scheme and begin a new volume with the change in the size at the time of the July issue. Owing to the variation in the size of the pages it may, however, be found advisable to bind separately the issues for the two halves of the past year. A comprehensive subject index of the articles appearing in the twelve monthly and the six daily issues for the past year has been prepared. The pages of this index are suitable for binding with the issues for either half of the year. On request to this office one or more copies of this index will be forwarded to those who desire to bind their copies of the Electric Railway Review.

Cost of Fuel for Power.

The cost of coal for steam locomotives is approximately 15 per cent of the total operating expenses for steam railroads, and is the largest of the expenses for materials. Data contained in the annual reports of a number of the larger systems indicate that the annual coal consumption is on the average about 2,500 tons for each steam locomotive. From the United States census report on "Street and Electric Railways," covering 799 operating companies, the cost of fuel for power for electric railways appears to be about $15,000,000. which is a little over 10.5 per cent of the total operating expenses. This figure is higher than would be obtained were only companies having the more modern generating plants included; in the census report is given a table based on the accounts of 17 selected companies in large cities which shows the average cost of fuel to be 7.2 per cent of the total operating expenses. In view of recent improvements in power plant design strictly modern power houses might be expected to show an even smaller cost for fuel. In attempts which have been made to compare the fuel consumption of steam locomotives, with a view to getting data on the savings railroads might expect from the adoption of electricity for a motive power, the difficulty has been to find a suitable unit of comparison that would represent exact conditions. The fuel economy of locomotives is at a great disadvantage when their average performance is measured by the useful work performed and compared with stationary engines and boilers. When the locomotive is at work and well under way hauling a train, the consumption of coal per horsepower-hour is low, but it is found that of the time locomotives are under steam and in the hands of the transportation department they are not making mileage more than 50 per cent of the time, and based on the total time there is an average of only about five miles per hour for freight service where schedules of 15 to 20 miles per hour are the rule. All the time the locomotive is standing at terminals or on side tracks awaiting orders, it is during six months of the year exposed to the cold winds and the losses of heat through radiation cause a large amount of coal to be consumed.

Results With Locomotives.

The stationary boilers and engines are well housed and the power developed by them is carefully measured out at the time it is wanted for use. In the laboratory tests of locomotives the engine and boiler work under conditions similar to a stationary power plant and the fuel and steam economy then compares much more favorably with the power plant used for electric traction. About the best results obtained are from four-cylinder compound passenger engines, which deliver a horsepower-hour at the drawbar for 2½ pounds of coal and 20 pounds of steam, and for freight engines the coal consumption is 3½ pounds per dynamometer horsepower-hour and the steam 28 pounds. The coal per indicated horsepower-hour for locomotives tested in the laboratory has been found as low as 2 pounds. Probably the best unit for comparison of the fuel used in steam and electric traction is the cost per thousand ton miles in passenger service. The figures for this were frequently found among the motive power statistics in the annual reports of steam railroads five or ten years ago, but since the introduction of large locomotives, it has perhaps become more embarrassing for railroad managers to explain the increase in this item, and in recent years such statistics are entirely omitted from the annual reports.

The Vermont Assembly and Annual Reports.

In their annual report for 1906 the railroad commissioners of Vermont censure the lawmakers of that state in words that may be of interest to residents of other states. Under the subhead of "Electric Railways" the report runs as follows: "No improvements in methods of accounting have been adopted by the electric railways during the past two years. The attention of the general assembly was called to this matter two years ago and it was recommended by this commission that the law be so amended that electric railways would be required to fully answer the interrogatories contained in the blanks prescribed by the Street Railway Accountants' Association of America and approved by the National Association of Railroad Commissioners. The general assembly gave no heed to the suggestion, with the result that electric railways ignore the requests of the commission for complete reports and the commission is powerless to compel full and complete answers to the interrogatories. But little information can therefore be obtained showing the exact financial condition of these roads and to all inquiries the humiliating reply must be given that while

Vermont has placed the nominal supervision of these railways in the hands of its railroad commission it has failed to arm the commission with sufficient power to compel the electric railways to furnish information respecting the operations of the respective lines, all of which is furnished by every steam railroad in the state without question, with one exception."

Approving Railway Stock Issues.

Speaking again to the state assembly the Vermont railroad commissioners emphasize clearly their position as regards the much discussed subject of illegitimate railroad promotion. It is not to be supposed that this class of financing exists in Vermont alone, therefore we quote a paragraph of the report: "Two years ago this commission called attention to the fact that methods have been employed in financing electric railways in Vermont that have proved disastrous to investors. No restraint whatever has been imposed upon capitalization or the creation of funded indebtedness, except the limitations of the charter and the consciences of the promoters, and those limitations are usually so widely in excess of the actual funds necessary to build and equip the road that a large margin is left in the shape of stocks and bonds, in which the public is invited and solicited to invest. The operation of the road discloses the fact that the gross earnings will not pay operating expenses and the interest on the bonds, to say nothing of any dividends on the stock. The result is a defaulting of the interest, loss of credit, shrinkage of stock and bond values, deterioration of road and equipment, receivership and foreclosure. And these inevitable results are being encouraged by the state at the behest of a few adventurers, who aim to reap large profits by the sale of securities which do not represent real value. Such a policy does infinite harm to the state as a whole. It discredits Vermont securities that are sound; it advertises the fact that Vermont is an open field for the promotion of hazardous enterprises and the flotation of illegitimate schemes calculated to separate a man from his money. The unexpected risks involved in an investment in electric railway securities in Vermont and the losses sustained by the investing public outside of Vermont affects the reputation and character of every kind of security offered the public which emanates from Vermont. Our state should be in line with Massachusetts on this subject and require every issue of railroad stocks or bonds to be approved by some competent authority in order that there may be some guarantee that they measurably represent actual value in the construction and equipment of the road."

Practical Car Service.

Mr. Connell's New England Street Railway Club paper on "Practical Street Car Service" is a welcome contribution to a branch of street railway practice which deserves much more careful study than it has been given in the past and which is quite as important in the commercial success of any large system as questions of power house economy and general rolling stock and permanent way maintenance. From the vantage ground of some 20 years' experience in routing cars and adopting time-tables to the requirements of traffic in the intricate streets of Boston the author deduces a number of conclusions which cannot possibly be overlooked by any large urban company anxious to give good and therefore successful service. The Boston situation is, of course, unique in many particulars and perhaps nothing is more significant than the promptness with which the public of the New England metropolis makes its desires known to the operating company which occupies the field, when any change in car service seems desirable. The timetable department of the Boston Elevated Railway has its fingers on the very pulse of the traffic and any fluctuation of public sentiment in regard to the service furnished is very soon detected. Perhaps there is no more critical public in the country and it is a well-known fact that the continuation or change of many policies in regard to types of cars made standard on the Boston system depends in no small degree upon the expressed wishes of the company's patrons. This very criticism—which finds an outlet through personal interviews with officials, complaints to employes, letters to the newspapers, to the company, etc.,—has gone far to put the men in the train service on the qui vive, and to give the public a service which is certainly most carefully fitted to its needs, as far as those needs can be foreseen.

Causes of Delays.

Probably the most suggestive part of Mr. Connell's paper to operating men in general is the section dealing with the causes of delays to rapid transit, particularly in the rush hours. These are aggravated by the fact that in Boston it becomes necessary to return to the suburban districts in the space of three hours—3:30 to 6:30 p. m. —the tide of travel which for eleven hours previous has been pouring into the business district. Small wonder is it that the number of surface cars increases from 716 to 1,375 in this period, with an increase in the elevated car service of from 96 to 150. On the most congested routes the average headway is 15 seconds so that even trifling delays are of immense importance. The traffic must be studied from every point of vantage in order to handle it successfully. Division or junction points are particularly favorable places from which to watch, as several routes can be studied at once. Low voltage, slow motormen, crowded platforms, excessive headway through over-speeding of a previous car running ahead of time, the obstruction of tracks by vehicles, excessive frequency and duration of stops, adverse weather conditions, drawbridges and grade crossings, all disarrange the car service. Aside from the dissatisfaction of the public with poor schedules, slow schedule speed means more cars in service for a given volume of business, which multiply into serious expense of operation on a large system. It is not easy to evaluate the money cost of delays, but it is unquestionably larger than one would suppose off-hand. Even the saving of 15 seconds in starting cars from terminals is worth while, according to Mr. Connell. We hope that more papers of this nature will be forthcoming.

London's New Traffic Facilities.

The opening of two new "tubes," that of the Great Northern Piccadilly & Brompton Railway, announced to take place at the end of the year, and of the Charing Cross Euston & Hampstead line, which is to be finished next June, will together with the Baker Street & Waterloo, revolutionize the traffic facilities of London. By the provision of interchange stations at central points through journeys are made possible over more than one of the tubes and the terminals have been located close to those of the trunk lines. Thus the Baker Street & Waterloo will, when completed, link up the Great Western, the Metropolitan, the District, the Southeastern & Cheatham and the Southwestern systems and the territory served by the Great Northern Piccadilly & Brompton will be given interchange with the other tubes through the station at Piccadilly Circus. For the first time it will be possible to travel by rail to the center of the Strand direct from north, south, east and west of London, and not only are the most important traffic centers of London given railway communication for the first time and placed within a few minutes of each other, but they are all brought within a short ride of the outlying suburbs. The Charing Cross Euston & Hampstead tube will, by means of the interchange station at Leicester square, join with the systems already enumerated. With the completion of these lines London will have a network of lines that unify the existing railways into one system, enabling the traveler to enter central London from any point and make a through journey to any other point.

Expediting Power Plant Construction.

Whenever the prospective or actual increase of traffic on an electric railway requires the extension of an old power plant or the construction of a new one, it usually happens that every day saved between the signing of the machinery contracts and the actual supply of current to the lines is worth a great deal to the operating company. To hasten the delivery of the new equipment engineers are frequently sent to the manufacturers' works and if the work in the shops is followed closely with a sympathetic understanding of the difficulties of forced production, it is sometimes possible to save quite a little time in deciding minor points which would otherwise be lost in tedious correspondence. In the application of even standard machinery to specific duties, there frequently arise desirable changes from the original plans and if an operating company is authoritatively represented, the mutual understanding of the factory engineers and the purchaser's expert may be most helpful in clearing away delays. There is another way, however, which should not be overlooked in endeavoring to shorten the waiting time as much as possible and that is the use of a part of the permanent auxiliary equipment in facilitating construction work on the plant itself. In some cases little can be done along this line; in other instances a large amount of work can be put through with the aid of either the old equipment of the plant or the new machinery which has not been made ready for regular service on the line.

Making Use of Auxiliary Equipment.

For example, one or two of the 25 or 50-kilowatt exciters for a new plant may have arrived on the ground with their engines while the main generating units may still be in the shops or on the road. Power could be utilized in a great many small ways in the completion of the plant if such power were available. The traveling crane is now always used in erecting heavy machinery if it can be delivered and installed in time; in many plants the exciters could be used to supply current for this purpose for the operation of special electric hoists attached to the hand-operated crane. Lighting of obscure corners by exciter current facilitates the completion of work in these spots and the operation of a small machine shop by a motor run upon temporary circuits, the driving of an air compressor or blasksmith's forge by a temporarily available motor, or the use of the exciters for operating electric heaters, all afford a chance to turn otherwise idle equipment to good account. Boiler capacity is generally available by the time a single generator is ready for even temporary service. Of course, power for the operation of contractors' hoists and other auxiliary equipment may be self-contained, as in the donkey engine, or it may be derived from a nearby trolley wire if the conditions are favorable; but in actual practice it is usually the case that some of these obvious uses of the first equipment to be set up are overlooked. There is always a great deal of muscular work in the construction of a plant which might be eliminated by the use of machinery; the point is simply to employ all available means to get the building in shape for business. It may be that the feed pumps can be pressed into service in connection with the drainage of certain parts of the plant; some of the regular piping may be used to supply steam at special points—the needs of each case will suggest in what way the idle auxiliary apparatus can be pressed into service. The matter is certainly worth looking into in view of the success of this method in ordinary industrial plants.

Free Transportation in Ohio.

From the discussion on the limitation of free transportation at the meeting of the Central Electric Railway Association at Dayton, Ohio, last month, it is evident that while not all of the Ohio interurbans have ceased issuing free passes, yet there is practically unanimous agreement among them upon the injurious effects of the practice. The discussion brought from Commissioner Gothlin the informal opinion that the Wertz law, under which the present Ohio railway commission was recently created, applied to interurbans and therefore prohibited all forms of free transportation except to a few specified classes, such as the indigent, the clergy and railway employes. Though no formal action was taken by the association the consensus of opinion was strongly against the free pass and no doubt the ascertainment of the commission's interpretation will lead the roads to abolish it completely. There was even a general feeling against the exchange of transportation for advertising because of the possibilities of manipulation which the exchange affords. We may shortly expect to see the Ohio interurbans upon the highly desirable basis of a strictly cash business.

A Lesson in Car Fittings.

On nearly all the principal steam railway lines a great deal of attention has recently been given to simplifying and at the same beautifying car interiors. In the case of one long-distance line, open or grill-work partitions have been constructed in the center of the cars to render its general interior appearance more restful to the eye, the desired effect being to secure the passenger's return trip by that line. The example is a worthy one and one which may be profitably followed by the electric roads, especially in regard to making the fittings more pleasing in appearance. Some of the more common fittings, which are of acknowledged importance as regards operation, but which, by the way they are frequently installed, do not add to the attractiveness of a car, include: bell and register cords, rods and straps, often in duplicate with their pulleys and brackets; hand straps, ventilator levers and wheels, lamp switches, fuse boxes, advertising cards and racks, health notices, car numbers, car builders' names and addresses, car-record holders, lamps and fixtures, clumsy registers and street indicators with dangling padlocks, broken and blurred mirrors, thermometers, clocks, fire extinguishers, parcel racks in all conceivable shapes and sizes, coat hooks, ticket holders, push buttons, door latches, exposed hinges and curtain rollers. These and others are common objects that are necessary for nearly every car and that by the way in which they are placed clearly indicate the character of the road and methods of its management.

Possibly Helpful Suggestions.

Compare the interior of an electric car with that of a modern steam railway coach and instead of those fixtures which are needlessly exposed in the electric car there are presented standard appliances, simple in design and harmonizing in color and effect with the car finish. For electric cars registers, in many cases, could be made in smaller sizes, finished to match the car interior and without protruding wheels and levers or dangling padlocks. If one type of fare register is used as standard for the system the cars could be designed with a suitable space or panel to accommodate the register on the end walls or partition. Except for heavy city traffic one rod, neatly supported under the deck sill, should be sufficient to operate the register. The signal cord might also be supported with the rod. Each ventilator-sash might be operated separately, as are the car windows, and another device discarded. The lighting fuse-boxes and switches belong in the vestibules as do also the car-record holders, car numbers, car builders' names, etc. If advertising cards and racks, bulletins and health notices must be placed on the end walls or partitions of cars, suitable spaces should be provided, as in the case of registers, with frames or mouldings of the same wood and finish as the rest of the car built in the wall or partition. The demand for more simplicity, harmony and cleanliness in car interiors is receiving merited attention by some managements. Their good work is to be commended.

Stock-Selling Promotion Schemes.

For the last few months the daily papers in the great cities, particularly the Sunday issues, have flamed with a full-page or half-page announcements of new companies, signed by unknown names, urging the purchase of their stocks, on which enormous returns are declared to be certain. The schemes upon which the fabulous profits are figured out in advance are various, including hundred-million-dollar electric railways and almost any other venture for which a skilful promoter can invent a well-sounding corporate name and write a persuasive prospectus. The main characteristics of this class of promotion schemes are not widely different. The pitiable thing about these schemes is the fact that they appeal chiefly to people of small means and no business experience, who are often tempted by the necessity of increasing their incomes, into forwarding their savings to the distant and unknown advertisers, without the shadow of security in return. The large-promising, cheap stock-selling scheme offers temptations to the unscrupulous and dangers to the simple-minded from which a degree of protection should be afforded, by newspaper proprietors, by public bodies or by the law. Some steps are being taken in that direction. The American Mining Congress, meeting at Denver, resolved to establish a bureau of information in the interest of the small investors who have long been the victims of dishonest promoters of worthless mining stocks, and some financial journals have begun to denounce wildly speculative electric railway and industrial promotions. It is time.

Some Totals of Railway Operation.

From a few advance figures issued by the Interstate Commerce Commission for the year ended June 30, 1906, it is possible to make some comparisons of the results of railway operation in the United States for the last and previous years. On classifying the returns for the fiscal years 1906, 1905 and 1900 totals affording interesting bases for comparison are found as follows:

	1906	1905	1900
Mileage of railways........	220,028	214,477	192,556
Gross earnings	$2.319,760,030	$2,073,177,325	$1,487,044.814
Passenger earnings	618,555,934	572,109.366	323,715,639
Freight earnings	1,640,942.862	1,449,182,702	1,049,256.323
Operating expenses	1,532,163,153	1,383,584,404	961,428,511
Net earnings	787,596,877	689,592,921	525,616,303
Gross earnings per mile....	10,543	9,666	7,722
Operating expenses per mile	6,963	6,451	4,993
Net earnings per mile......	3,580	3,215	2,729

Great expansion of railway business, out of proportion to the increase in mileage, is here indicated. Comparing the two last years we find that while the railways increased by 5,551 miles, or a little over 2½ per cent, their gross earnings increased $246,582,000, or nearly 12 per cent, and while operating expenses increased $148,500,000, or 11 per cent, net earnings increased $98,000,000, or 14 per cent. Comparing 1906 with 1900 the increases in six years are still more remarkable. While mileage gained 27,472 miles, or 14 per cent, gross earnings increased $832,000,000, or 56 per cent; operating expenses advanced $570,000,000, or nearly 60 per cent, and yet net earnings were greater by almost $262,000,000, or 50 per cent, than in 1900. The large increase in the average of mile-earnings is notable—gross from $7,722 in 1900 to $10,543 in 1906, and net from $2,729 to $3,580 in the same years.

Labor and Elections.

The degree of success attained in the effort of "Labor," by which term is meant that small proportion of the wage-earners of the country who accept the dictation of Samuel Gompers, to revenge itself upon those congressmen who dared to take an independent position upon the measures urged by the American Federation of Labor is not likely to encourage further efforts of similar character. Not one of the men against whose re-election Mr. Gompers fought most strenuously was defeated, and some of them were returned by increased majorities. In the case of the most prominent of all, Speaker Cannon, the attack seems to have been the direct cause of an increase which was evidently intended as an indorsement of the precise acts criticised by the leaders of "Labor." On the whole it is well, once in a while, to learn by such episodes as this that American citizens do not vote by classes. Organized labor, as well as the greater group of unorganized workers, contains republicans, democrats and independents. And few, if any, will permit their political action to be dictated by leaders any more than they would allow their employers to control them in the same matters. The Gompers fiasco will not be repeated by any other labor agitator until its lesson has been forgotten. It is worth noting that the organizations of railway employes took no part in it.

More Subways for New York.

Practically all of the necessary formalities precedent to advertising for bids for the construction of 50 miles of new subways for Greater New York, costing $125,000,000, have now been completed. The plans and specifications which were prepared long ago by the rapid transit commission have been approved by commissions appointed by the courts, and a subcommittee of the board of estimate, which has powers co-ordinate with the rapid transit commission in regard to new transportation routes, has reported favorably on three of the twenty routes recommended by the commission, namely, the Lexington avenue extension of the present subway, the Seventh and Eighth avenue route, and Mr. Coler's triborough subway from Pelham Bay Park to Coney Island. The construction of these subways will add greatly to the transportation facilities of New York, but the great problem of traffic congestion has by no means been solved. The New York state railroad commission recently issued a statement that the city's traffic is increasing at such a rate as to completely neutralize the expected relief from the subways. The situation seems to require more expedition in the adoption of remedies.

Two Bodies for One Set of Trucks.

One of the interesting problems in electric railway economy is that of keeping the rolling stock away from the shops and storage barns, where it does not help earn dividends. When conditions are not suitable for using convertible cars two sets of rolling stock equipment, one for summer and one for winter use, are generally required by weather conditions. The City Railway Company, Dayton, O., is thus supplied, but it has, however, only one set of trucks, which are adapted for use with both types of car bodies. This company's passenger rolling stock comprises 16 convertible cars, 80 summer car bodies and 60 winter car bodies, with a sufficient number of trucks for mounting all of one kind of body at one time. It is the practice to transfer the trucks in the fall and spring. Thus, while a portion of the investment for rolling stock is idle for a part of the time, this investment is considerably less than it would be if the idle car bodies each had a set of trucks and motors remaining in storage with them. In an argument for and against this practice the debatable question would seem to be whether the cost for transferring the trucks from one kind of body to another and back again each year would not be more than offset by the interest on the added investment for extra trucks and the flexibility of operation afforded by having all the rolling stock in operating condition at all times.

HANDLING PASSENGERS AT ENDS OF SURFACE CAR ROUTES.

The importance of cutting down the number and duration of stops by cars operating on fast schedules is coming to be more generally appreciated by electric railway managers, but the full significance of the terminal stops of surface cars is not yet perceived in many quarters. A great deal has been done by trolley systems to improve the schedule speeds of cars between terminals, but there is still much to be done in bettering conditions at the ends of the routes. Prompt handling of passengers is most desirable, and in this connection the movement of the cars themselves deserves full consideration.

Questions of this kind often look like fine-spun theories to the practical operating man, and chiefly because it is so difficult in street railway work to maintain uniform service over long periods of time. There are many reasons for this, but the two most important are the location of the tracks in the streets themselves, where it is never certain that the rolling stock can make a run over its route without delays of one kind or another, and the fluctuating demand for transportation on the part of the general public. Hence, it often appears irrational to the men who handle the traffic to treat the problems of car movement and passenger travel on the basis of exact figures. Such men naturally ask the use in figuring schedules with fixed numbers of stops per mile, when it is easily seen by a single trip over a route that a car rarely stops uniformly in passing from one end of the line to the other, except on interurban or elevated roads, where there are regular stations as in steam practice. The answer to this attitude must, of course, be the need of treating transportation problems involving many available factors on the basis of integrated performances and resulting averages, in the absence of the power to foresee the variations in each trip of each car. For this reason averages of delays at ends of routes may be very instructive.

The root of the whole matter of terminal delays on surface lines is simply that every moment a car stands idle on the track is a moment of relatively heavy expense to the operating company. It is, of course, true that in street railway work some leeway must be allowed in the schedules of cars operated in crowded streets, but as the scheme of throwing extras into service becomes more and more perfected, the margin ought to be steadily reduced, and especially is it desirable to make short stops and layovers when the cars are behind time.

The arrangements of the tracks at the end of a surface route ought to permit an outbound car to make a clean run to the final stopping point without being delayed by other surface cars crossing over or passing in the opposite direction. Sometimes heavily loaded cars are stopped a hundred yards short of the end of the route on account of inadequate trackage or belated movements against traffic in shifting. The double stop thus entailed is a source of no little delay. When a car reaches the end of the route passengers should be so informed and requested to leave the car by the nearest door—the result of a courteous remark is often to save a considerable amount of crowding and time. Of course, at points where large numbers of passengers are in a hurry to enter a car, it is a better plan to ask the passengers in the car to go out at one end while newcomers enter at the other. It is a poor plan to be in too much of a hurry to shift the trolley at night at the ends of routes, because the sudden change from light to darkness retards the progress of the passengers and tends to cause delays through the losing of bundles and other articles. These points may seem small in themselves, but they exercise a very positive influence in the long run economy of operation, and the time is coming when no point of this nature will seem too small to study in connection with the perfection of service. There must be elasticity in all plans for handling street railway traffic, but there must also be a growing realization of the fact that time is quite as valuable an asset as a well-equipped power supply. The reduction of lost seconds on a large street railway system is well worth striving for. Wages and fixed charges are functions of time and every moment which can be swung from the idle to the productive transportation column is valuable.

TENDENCIES IN CAR DESIGN.

Nothing is more significant of the broadening prosperity and usefulness of the electric railway than the increasing attractiveness of car designs. The cost of a modern trolley car fitted with the best equipment and finished in good taste now runs nearer to $8,000 or $10,000 than to $5,000 or $6,000, so that it is probably safe to say that three of the cars of ten or twelve years ago could easily be purchased by one of the latest interurbans. Even cars for purely city service have increased notably in price during the past decade. Of course, one may lay out an indefinite sum of money upon interior finish, just as in buying an automobile the mechanical cost may easily be doubled in fixtures and furnishings, but the fact remains that the standard of public acceptability constantly seeks higher levels. Every new electric line, especially in competitive territory, meets an insistent if unformulated demand for handsome cars from its patrons.

Extravagance in finish is not be counselled for a moment, but it is well, even for roads of small means, to realize that the public looks upon the appearance and characteristics of the cars as indices—along with the bearing and appearance of the platform men—of the general attitude of the company. It pays to point out the comparative appearance of new trolley cars and competing steam coaches in the company's published utterances.

Aside from the tendency toward greater beauty of appearance, there is also a drift visible at the present time in the direction of the semi-convertible car. In climates where the weather is changeable there is a growing demand for cars which can be altered quickly on the road for closing or opening as the case may be. Everyone knows that it is costly business to maintain two sets of car bodies on any system. Fixed charges and the cost of changing over tend to become excessive, and such a scheme is never as flexible as the theoretical ideal of the semi-convertible car. Some new semi-convertible cars which have recently been placed in service on the Boston-Salem line of the Boston & Northern Street Railway are typical of the latest tendencies in design, having vestibule doors operated by compressed air, with folding steps, wide vestibules and oil-waste motor lubricators. There is not the slightest doubt that a large number of accidents will be eliminated by the sliding vestibule door, as with the famous Minneapolis gate, but it remains to be seen how well the obstruction any gate or door offers to free entrance and exit will be tolerated by the public on lines where stops are at all numerous. On a train of four or five cars the pneumatic doors sometimes act very sluggishly, and it is often impossible for a passenger to leave or enter such a train until four or five seconds after the car has come to a full stop. The widening of vestibules is a real gain in the direction of rapid transit, but there is still a little doubt, in our opinion, about the final status of the folding step and the pneumatic door. The desires of the public can only be learned by actually placing various types of cars in service, and, within pretty wide limits, it is the public that finally settles the type best adapted to any given locality and set of conditions.

THE SUBURBAN FEEDER PROBLEM.

The feeder problems on a large electric railway system operating in city and suburban territory are seldom solved permanently. Traffic is perpetually shifting from one place to another, and as the conditions of car movement change there is a tendency for feeders to become either overloaded or underloaded, rather than to remain carrying currents which are transmitted at a fair average of efficiency. If one could actually see the current flow through a complex system of feeders in response to the traffic demands, it would be most interesting to note the performance of the various distributing lines in respect to their economic capacity. Between a wasteful surplus of C^2R losses, on the one hand, and wasteful fixed charges due to fractional loads or complete idleness, on the other, there would be a wide range of efficiencies which could throw no little light upon the best copper layout for any given system. The thoroughly scientific treatment of the feeder gives it a current rating for maximum economy just as a generator or motor is rated.

Important as it is to study the feeder problems of the congested districts, it is still necessary to look after the suburban feeders for these often involve very serious losses. It is a well known fact that on an electric railway nothing like the close regulation of the central station circuit is needed for operating continuity, and so all sorts of voltage fluctuations are permitted within a pretty wide range. As long as the voltage does not fall much below 475 or even 450 at the ends of suburban lines, it is frequently held that the feeder problem has been settled. With the growth of traffic, however, it becomes of great value to secure accurate records of the performances of suburban feeders, particularly as these are usually long and in no sense as well tied together as the feeders in downtown streets.

In general the suburban feeder problem consists in maintaining the most economical copper distribution for the service given, including, of course, that cross-section of cable which will insure a certain irreducible minimum of voltage at the end of the line. It is a grave question if that minimum should be less than 500 volts under modern conditions of car movement and motor capacity. An average of 550 volts, or even 575 volts, on a suburban line with cars running on five-minute intervals, double-tracked, is certainly not too high to facilitate making a good schedule speed. Feeder efficiency of necessity involves the large question of forced mileage output per hour from the cars. There is little economy in putting 200-horsepower equipments, good for 1.5 or 2 miles per hour per second acceleration at normal voltage, on a line where the potential dims the car lights below the reading point during starts on account of the slender feeder capacity overhead. If the feeder system between the power house and the trolley wire is not of sufficient capacity there is very little value in building new power stations with turbo-alternators of close regulation characteristics and high overload capacity. Slow schedule speeds are unavoidable in crowded streets, so that on the suburban portions of runs, if anywhere, the voltage should be well maintained.

With increase of suburban traffic there comes a time when it is a question whether it will not be more economical to build a new power plant in the territory than to continue to increase the copper investment and feeder losses. The gas-engine station, with its high economy for small capacity and its comparatively inoffensive character in residential districts, is already bringing the question home in certain cases where the traffic has outgrown the feeders. The solution is a matter of skilled engineering based upon long-continued work in the territory of the company, and numerous voltage and current records on cars and along the tracks of the district, taken under variable traffic conditions. Recording ammeter and voltmeter records are easy to secure at different points in the feeder system, and careful deductions from these are worth far more than hap-hazard guesswork as to the needs of the system. It is always well to remember that the so-called copper economy of a feeder is important to know in any investigation of a distribution problem from the financial standpoint, but the operating department's opinion of the voltage requirements is quite as essential to ascertain and act upon.

THE LOCATION OF AUXILIARIES IN TURBINE PLANTS.

Although there are now certain generally accepted standards in the design of power plants, such as the separation of boilers and gas producers in a compartment distinct from that which houses engines and generators, the orderly arrangement of coal-handling machinery or methods, the direct supply of live steam or gas to the prime movers, and even the segregation of switching apparatus from the rest of the building, there remains unsettled in location a number of auxiliaries which can in many cases be treated effectively as a group. Especially is this the case in steam turbine plants.

Of course, no sensible engineer designs a modern power plant without due regard to the special conditions prevailing in each case, and it is extremely rare to find two plants even on one system, which are duplicates in detail. The uniformity with which telephone exchanges are equipped does not obtain in railway circles. At the same time there is little doubt that in many plants a more desirable grouping of equipment might have been made and some of these features are worth considering.

When one counts up the number of boiler-feed, circulating, oil, wet-vacuum, dry-vacuum and possibly sump and compressed air and step-bearing pumps which are in necessary service in a modern turbine station, and adds to these the various heaters which may also be on duty, it soon becomes evident that if these are scattered about in different dark corners of the plant, the piping will be unnecessarily expensive to put in and to operate. The equipment will not receive the constant oversight required in the best maintenance practice and the whole installation will tend to become less reliable for continuous service. Cases are not uncommon where the breaking down of a single feed-pump has put a whole station out of business, and not a single piece of machinery in a modern plant can be safely operated at long periods without careful oversight lest it go out of service and tie up a large number of cars as a result.

Auxiliary equipment has, until very recently, been located almost invariably in the boiler room. The natural place for the feed-water heater and the feed pumps has seemed to be at one side of the fire room, though the heater has frequently been located in the engine-room basement in later plants. Often the only place left for the feed pumps has been in the passageway between boiler batteries or between the boilers and the walls, dark and uncomfortable spots in the majority of cases. Such pumps are built for hard service, but they need attention as well as anything else, and plenty of light is requisite. As to the other auxiliaries there is no doubt that condensers should be placed as close as possible to their respective turbines and generally this means beneath or beside the sub-base in the upper part of the basement. There would seem to be little reason for scattering hot-well, vacuum and circulating pumps all around a plant, as was done in a recently completed installation where the dry-vacuum and hot-well pumps for each turbine were located in the engine-room basement beneath each machine, the oil pump being installed in another obscure corner, with the boiler-feed pumps on the boiler-room floor, while the circulating pumps were in a faraway corner of the boiler-room basement, with a boiler-feed makeup pump in still another spot.

If equipment of this character is placed in the engine room the chances are that it will receive ample attention, but at the cost of a good deal of space. The best example of this kind of construction which occurs readily to mind is the plant of the Old Colony Street Railway Company ,at Quincy Point, Mass. Here the engine, or more properly, the turbine room, is divided into galleried sections for each machine with an open basement. Everything can be handled with ease by the overhead crane, but there is not quite the same freedom of movement possible by employes, we believe, as would be the case with a large percentage of solid floor in the turbine room.

The concentration of as many auxiliaries as possible in a special pump room is after all the most interesting practice at present. It is certainly a decided operating advantage to get as many pumps and heating auxiliaries as one can under one's eye in one place. Although not a railway plant the power house of the Harvard Medical School, at Boston, is very suggestive in its special pump room to the street railway power-plant designer, who is at times embarrassed as to what to do with his auxiliaries. The use of a special pump room may or may not add to the cost of piping, according to circumstances, but it is well worth thinking about in face of the present tendency of power-plant designers to group like units in common operating centers.

COMMUNICATIONS.

Inside Guard Rails.

To the Editors:

Your timely article on the drawbridge accident at Atlantic City refers to the necessity of railroads using inside guard rails at all points of danger from derailment. This is a precaution that applies particularly to railroads and one that forced itself on my attention as the result of an accident that occurred several years ago, on one of the New England roads, where a car left the rail on a bridge, ran some distance on the ties, then rode over the outside guard timber and plunged to the ground below with a great loss of life.

A personal investigation at the time led me to the conclusion that had that guard timber not been there the car would not have left the bridge and to its presence I attributed the immediate cause of the disaster. It was a single-track road and the timbers used as ties were heavy enough and long enough to hold the car when it had swerved the full width of the track, and the inside rail would have served as a guard to prevent the car from swerving further. But unfortunately—and this is the point that applies particularly to all electric roads—the guard rail being three or four inches higher than the track rail, the motors slid on top of it and it formed a fulcrum on which the car rocked and tipped up the truck enough to carry the outside wheel over the inside rail, thus permitting the car to go on to its destruction.

The history of electric railroading has been a gradual adaptation of steam railroad practice to street railway work and naturally enough, that which had been deemed sufficient for steam roads was considered good enough for electric roads. This was apparently the theory acted upon in changing over the West Jersey road to electric service, not taking into consideration the small clearance between the bottom of motors and rail, some two or three inches, as compared with the ample clearance to be found in steam locomotives, and there is no doubt that the outside guard rail acted in the same way in this case, and the presence of inside guard rails would have been more of a safeguard against this accident.

GUARD RAIL.

BRITISH ELECTRICAL AFFAIRS.

(FROM OUR LONDON CORRESPONDENT.)

The most important event in British electrical matters during the past month was without question the report of the Highways committee of the London County Council embodying the scheme which parliament is to be asked to sanction at the next session. The scheme is one for the supply of electricity in bulk to London and the surrounding districts—or over an area of 457 square miles at an estimated cost of $20,250,000. The report points out the importance of electrical power as a means of developing and extending the commercial interests of the metropolis, and says that the need of a cheap supply has long been recognized. The area of supply includes not only the entire county of London but also several adjoining boroughs and districts. It is proposed that the council shall be empowered to acquire compulsorily at the expiration of five years from the passing of the bill, or at any time thereafter by giving one year's notice the existing undertakings of the borough councils of Battersea, Bermondsey, Bethnal Green, Fulham, Hackney, Hammersmith, Hampstead, Islington, Poplar, St. Pancras, Shoreditch, Southwark, Stepney and Stoke Newington.

With regard to the undertakings of companies the committee says: "A large number of orders have been granted to companies to supply electrical energy in the area dealt with by our scheme. As regards the undertakings in the county of London, the several local authorities have powers of compulsory purchase, the latest date at which any of such powers become first exercisable being 1931. There is also a power of purchase at recurring periods thereafter. The undertakings outside the county are not purchasable until 42 years from the respective dates of the authorizing orders. "In regard to most of the companies' undertakings, the purchase rights of the local authorities, particularly in London, are complicated by the fact that few local authorities are in a position to purchase a generating station and distribution system exactly proportioned to the needs of their particular district. * * * The advantages which will be secured by placing the powers of purchase in the hands of a central authority are therefore obvious, and it appears to us that this is the only practical solution of the problem. We, therefore, recommend that the council should be empowered to purchase compulsorily the undertakings of companies within the proposed area of supply at the time when, and on the terms on which, such undertakings would have become purchasable by local authorities, or at any time purchase by agreement the whole or any part of such an undertaking. We also think that the bill should provide for the council to be enabled to enter into any agreement with companies which it may consider advisable in the interests of its undertaking. We also recommend that powers be sought to enable the council compulsorily to take over from the present authorized distributors the provisional orders for those districts within the area where no supply is at present obtainable."

It is proposed that the generating station to be used for the scheme should be erected on one of two alternative sites; one of these is situated at Barking and the other at Erith and the committee suggests that compulsory powers of purchase should be sought in respect of each of these sites. They have selected these sites after very careful consideration of the needs as a whole of the area to be dealt with, and have come to the conclusion that by adopting one of them great economy in the transmission of energy will be secured.

The proposed generating station would be erected in sections which could be proceeded with as the demand requires. The site acquired will be large enough to enable the station to be subsequently increased to very large capacity to meet the anticipated increase in the demand for power resulting from a cheap supply. They think that subject to the proper safeguards the council will desire to give effect to the recommendation of the select committee that an obligation to supply should be placed upon the council. This will necessitate provision being made for a supply adequate to the probable demand from existing enterprises as well as to meet the requirements of large individual consumers, such as railways, tramways, docks, waterworks, etc., to which they think that the council should have power to supply direct, in addition to giving a supply untransformed at high pressure and of the kind which may reasonably be required by the various classes of consumers and provide the necessary transforming apparatus.

The committee is confident that the prospective demand for electricity is so great that the revenue derived from the undertaking will be more than sufficient to cover the expenditure including the charges for sinking fund and interest on capital and they are strongly supported in this view by the experts employed by the council. There is, however, great difference of opinion as to whether a large demand for power really exists in London. This may account for the council's caution, as the scheme contemplates that the new bulk supply station shall be built in sections to meet the increasing demand as it arises, and the scheme accordingly provides for the expenditure to be spread over a period of seven years. They point out that it is of the utmost importance to London and the surrounding community that a cheap supply of electricity should be available for manufacturing purposes, and they are strongly of opinion that there should be no delay in placing its manufacture and distribution on a sound and economical footing. Within the proposed area of supply the volume of manufactures is greater than in any other manufacturing district in the United Kingdom, and a vast and increasing population is engaged in its industries.

The elections of the London borough councils have just taken place and have resulted in a complete change of parties, the Reformers (opposing the progressive or public ownership party) having won 26 out of 28 boroughs. How far this will have the effect of modifying the scheme outlined it is too early to say, but as the London County Council elections take place in March, 1907, and as it seems probable that the Reformers may win these as well, it will most likely mean an era of rigid economy in the expenditure of public money and a restriction of municipalization generally, and might have the effect of delaying the completion of the scheme, or even opening the door to private companies, who, in the electrical field, are waging a fierce war against the council.

There are certain branches of electricity in which competition, especially that of German electrical firms, has lately begun to be felt in England. The directors of many English companies complain bitterly and seem to think it likely that they will be ousted from the trade. Where the competition is most felt is in the industrial enterprises such as mining, iron, steel and textile industries, etc., but special and difficult problems such as winding, hoisting, pumping, rolling mill, and loom and ginning machine driving by electricity are met in these branches. And prices are not the principal consideration; there are different questions of much greater importance to be considered. The English electrical industry has for many years past followed the example of America and has busied itself apart from electric light installations with the erection of central stations and tramways, but the question of converting industrial works from steam to electrical drive has been neglected. German electrical firms have for years past made a careful study of the different methods of utilizing electrical power for the above mentioned operations, and have carried their ideas into execution in thousands of successful installations on the continent; they are consequently many years ahead of England and the United States of America in this very important development. Industrial concerns of the nature referred to, requiring new plant to replace old, naturally desire to have their new installations carried out by specialists who are fortified by the greatest possible experience, who know the methods of working and the requirements of the factories in detail, and can assist the companies by giving advice in each individual problem. Nobody in Germany considered it a grievance that for many decades the whole supply of steam engines, locomobiles, agricultural engines, etc., had to be supplied by the English manufacturers, and moderate German import duties have never proved an obstacle to the introduction of first-class English makes of modern efficiency.

In reality it is not the foreign competition which has a baneful effect on the English business, but more than anything else it is the pernicious habit of cutting prices at home.

Looking through the offers for important installations as they are from time to time published in English journals, one finds practically without exception that the English firms spoil the prices one against the other. This can hardly be avoided considering how many big factories have been created in England during the last few years. The British Westinghouse Company has built a factory which alone would be capable of supplying the biggest part of the English market. The British Thomson-Houston possesses great works; Siemens Brothers also are installing the new single-phase system for the Midland, having under the guidance of the very intelligent management of their German firm also built a new and large factory, and will be sure to make their position more felt in the near future.

It has now been definitely agreed between the Oerlikon and Siemens-Schuskert works to commence immediately the plant for the electrification of the whole length of the St. Gotha railway. The section from Zurich to Lucerne is to be constructed first as an experiment. The first section is the only one at present approved of by the federal railway department but it is stated that a syndicate has offered to convert at its own cost the whole part of the line which is situated in Switzerland by 1909, and to transfer it to the Swiss government on terms yet to be agreed upon.

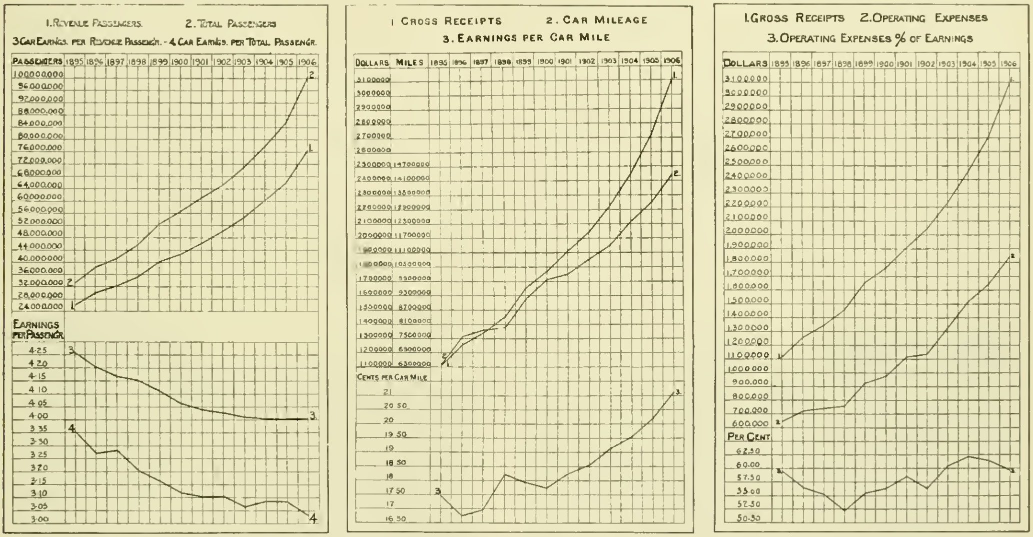
The tramways of the old English university city of Oxford are about to be converted from horse to electric traction on the Dolter surface contact system.

The Dolter system consists of a long iron skate or runner suspended from the under part of the car so that it touches the surface of a number of iron blocks embedded in the road which slightly project above the general surface. Each of these blocks forms the upper part of a small watertight contact box which is suspended by a bell crank lever. The lower arm of the lever carries a carbon piece so arranged that it is brought into contact with a fixed carbon piece which is connected permanently with the underground cable. When the car passes over any surface contact block the magnetism of the skate, acting through the iron surface block, attracts the lever and so brings the two carbon contact pieces together, completing an electric circuit. As the car passes along, the skate successively magnetizes the blocks as it comes to them, and so keeps up a connection with the cable. The blocks cease to be magnetized as the skate leaves them, and the levers in consequence fall, cutting off the surface blocks from all connection with the cable. In order to provide against the contingency of the lever failing to fall and break the connection, as the car leaves any of the contact boxes, a supplementary device is employed by which a short circuit action is given, blowing the fuse provided in the contact boxes, the faulty box being cut off from any connection with the cable.

The company which had the lease of the old line up to the end of this year proposed in 1902 to electrify the system using the conduit system in the central and ancient parts of the town, and the trolley system elsewhere, but the council refused to consider the terms offered. The method of traction to be chosen was confined to existing surface contact systems, namely:—the "G. B." (in operation at Lincoln) the Lorain (in operation at Wolverhampton) or the Kingsland system, and the Dalton system (in an experimental and incomplete stage at Hastings and Torquay). The council, after inspecting these systems, decided on the Dolter system, and the National Electric Company secured the contract, with a modification suggested by the tenderers to the effect that the Dolter system should not be installed until it had been working satisfactorily somewhere else in England for six months. The tender provides for the lessee paying all expenses incurred by the city in connection with the conversion and a substantial annual rental.

MONTREAL STREET RAILWAY REPORT.

The annual report of the Montreal Street Railway for the year ended September 30, 1906, which was recently issued, shows a gratifying increase in gross earnings over 1905 of $393,012, equal to 14.52 per cent, while net earnings increased $192,858, or 18.25 per cent. An interesting feature of the report is an accompanying supplement which contains a set of curves showing the gross receipts, operating expenses, earnings per car mile, passengers carried, etc., for the past 12 years, and an excellent map of the company's system. Gross receipts have increased from $1,102,777 in 1895 to $3,100,487 in 1906; operating expenses from $652,812 to $1,850,720; net earnings from $449,966 to $1,249,767; while the number of passengers carried has increased from 25,877,758 to 76,356,099. A comparison of the business of the company for the 12 years ended September 30, 1906, is given in the statistical statement.



Montreal Street Railway—Curves Showing Operating Statistics.

During the year the amount of outstanding bonds, $2,509,368 was not increased but the loan from the Bank of Montreal was increased by $833,975.

President L. J. Forget, in presenting the report to the shareholders, made the following general statements:

Owing to the growth of the city, several new extensions to the tracks of the company have been constructed during the year and the rolling stock and equipment have been increased to keep up with the requirements of the traffic.

During the year an agreement was entered into with the parties owning the stock and bonds of the Montreal Terminal Railway Company to purchase their interests.

In order to provide funds for the floating debt of the company, and for additions to the plant and property and extensions of the system, it will be necessary to issue further securities, and your directors have seriously considered this matter, and are of opinion that in view of the large expenditures necessary at the present time for renewals of the company's tracks and equipment, that either bonds should be issued or stock at such a premium that the interest charges will not be too great a burden on the net revenue of the company. For this purpose a special meeting of the shareholders has been called to authorize the directors to take action in the matter.

The company has paid to the city of Montreal the usual property and business taxes and tax on earnings, $191,696.59; account snow cleaning, $15,031.13; making a total of $206,727.72.

The directors in January last decided on a policy of setting aside a certain percentage of the gross earnings each month to the credit of the contingent renewal account. This together with other sums transferred to this account made a total credit to the account of $310,561, against which was charged the amount expended during the year of $302,744. An amount of $25,000 was placed to the credit of the fire insurance fund which now amounts to $341,245.

The general operating account for 1906 and 1905 follows:

	1906	1905
Gross	$3,100,487	$2,707,474
Expenses	1,850,720	1,650,566
Net	$1,249,767	$1,056,908
Charges, Etc.	546,064	363,739
Surplus	$ 703,703	$ 693,169

A new generating station for supplying electricity for the street railway system of the London County Council, England, has recently been put in operation. When extended to its full proposed size this station will have a capacity of 34,000 kilowatts and will have cost about $4,500,000. Only half of it is now completed and equipped, the other half being under construction.

IMPROVEMENT OF THE BRIGHTON BEACH LINE OF THE BROOKLYN HEIGHTS RAILROAD COMPANY.

The Brighton Beach division of the Brooklyn Heights Railroad Company is one of the four roads, formerly operated by steam, over which traffic from the street surface and elevated railroads of the Brooklyn Rapid Transit system is now carried to Coney Island and Brighton Beach, and is one of the lines involved in the controversy now in the courts over the proposal to compel the Brooklyn Rapid Transit Company to carry passengers to the beach resorts for a 5-cent instead of a 10-cent fare.

Brighton Beach Line—Retaining Wall, Showing Manhole Opening and Seat for Street-Crossing Bridge.

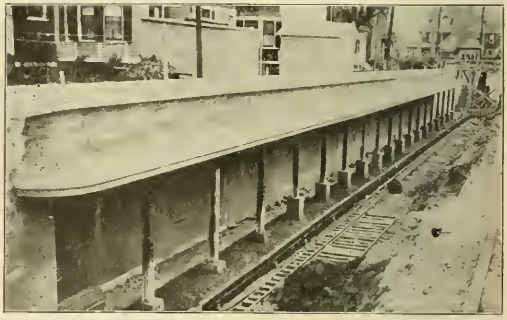
When this road was operated by steam it was a double-track line, extending from Atlantic avenue to Brighton Beach. The road was built on private right of way on a level with the country through which it passed, except for the first two miles from Atlantic avenue, which was an open cut. This line formerly made connection with the Long Island Railroad, and its trains were operated into the Long Island terminal. After enduring various vicissitudes the line became identified, in 1898, with the Brooklyn Rapid Transit system. Connection was made by an incline and elevated structure with the Fulton street line and the line was equipped for electrical operation.

Brighton Beach Line—Method of Excavating for Trench Showing Temporary Supports for Brick Building and Derrick for Handling Earth.

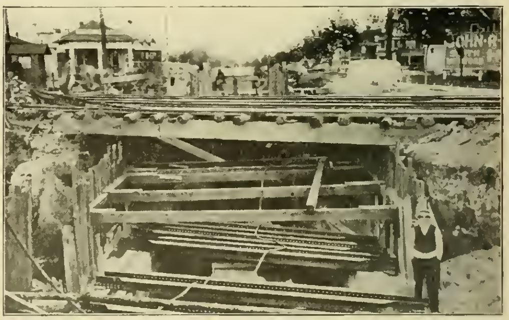
Scope of Improvements.

The necessity of eliminating crossings at grade has led to a radical reconstruction of the entire line, including a complete change of profile. For convenience the work has been divided into three sections. Section 1, extending from St. Marks avenue to Sterling place, involved the eliminating of two street crossings at grade by the elevation of the track upon a solid embankment, and the depression of the streets to provide a clearance of 12 feet. These streets were spanned by through bridges, and a new station was built at Park place. From St. Marks avenue to the junction with the Fulton street line the tracks are laid upon an elevated steel structure, and in harmony with the general purpose of making this a high speed line, it is proposed by the railroad company to straighten this line by the elimination of a bad reverse curve and establishing a solid embankment held by retaining walls. The work on Section 1 is completed.

The new work to which special attention is now directed is that comprised in Sections 2 and 3. Section 2 is a cut 6,400 feet in length, extending from a point about 300 feet south of Church street to Fisk terrace, near Avenue H. From this point the line reaches an embankment by a grade of 1.829 per cent, and extends on this fill to Coney Island avenue near the Brighton Beach resorts. That portion of the work represented by the fill is designated Section 3, and is 19,600 feet long. From Church street to the end of the improvement at Brighton Beach, through the cut and on the fill, it is proposed to make the road a four-track line, the two outer tracks to be used for local, and the two inside tracks for express traffic. All of this work is undertaken under the grade crossing laws of the state of New York, and is under the active supervision of the Brooklyn Grade Crossing Commission, of which Mr. John H. Dwyer is chief engineer and Mr. Harry B. Snell is principal assistant engineer. Through their courtesy and with the co-operation of the Brooklyn Rapid Transit Company we are able to present herewith drawings and photographs illustrating some of the interesting features of this work.

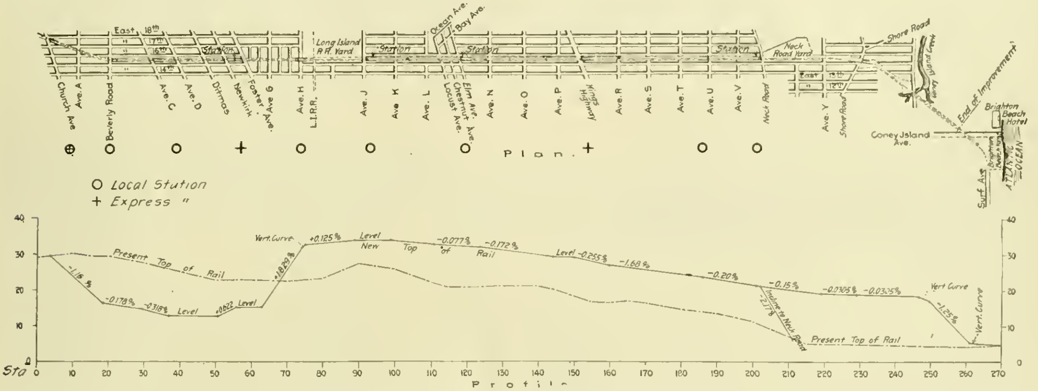


Brighton Beach Line—Local Station Platform Showing Reinforced Canopy and Concrete Protection Around Column Bases.



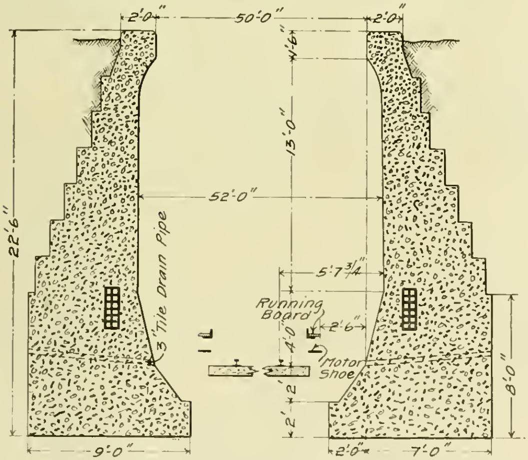
Brighton Beach Line—Trench Excavation for Foster Avenue Sewer Showing Track Supporting Beams before Placing.

That portion of the improvement comprising the subway presents some aspects of unusual interest. The problem confronting the engineers had three prominent difficulties. It was necessary to make the cut deep enough to allow the several streets to be carried over on through bridges of solid floor construction, and at the same time to allow sufficient clearance for the cars. The second difficulty lay in the fact that it was impracticable to go too deep, on account of the impossibility of securing proper drainage, the topography of the surrounding country being such that only with great difficulty could sufficient fall be secured to permit the water from the drainage system in the cut to empty into the city sewer system. The third difficulty was the necessity of building a four-track line with express and local stations within the narrow right of way, which was originally 50 feet over the greater portion of the district.

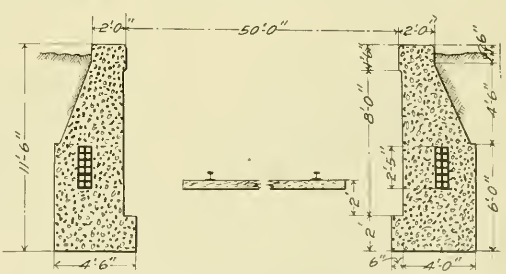


Brighton Beach Line—Plan and Profile of Route.

A solution of the drainage problem was reached only by the construction of a new sewer down Newkirk avenue, a distance of three-quarters of a mile, and thence down Rogers avenue for a distance of 1,500 feet to a connection with the city sewer at Avenue F, including a revision of the city sewer in Avenue F for a certain distance. The drainage system in the cut consists of a 12-inch longitudinal pipe from Albermarle road to Beverly road, an 18-inch pipe from a point midway between Beverly road and Avenue C, and thence a 24-inch pipe to a point midway between Avenue D and Ditmas avenue, and two 24-inch pipes from that point to the 36-inch brick sewer, built in Newkirk avenue, with a similar longitudinal drain from the other direction. Into this system empty 11 transverse drains at designated points.



Typical Section for 22 Ft Cut



Typical Section for 11 Ft Cut

Brighton Beach Line—Typical Sections of Retaining Walls.

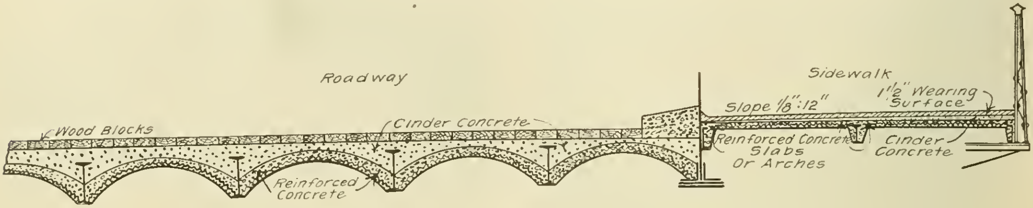
Right of Way Conditions.

The difficulty due to the narrowness of the right of way was obviated by an agreement with the abutting property owners by which, in consideration of the company's willingness to expend the necessary funds for an open cut subway, the property owners agreed to give them an easement of approximately 7 feet on each side of the right of way, in which to build the retaining walls. At the express station point in the subway, that is between Newkirk avenue and Foster avenue, an agreement was reached whereby the company secured an additional easement from the property owners of 12½ feet on each side, to permit spreading the tracks to make room for two island platforms between the local and express tracks. The company in turn agreed to restore to the property owners the entire width of the easement taken, by constructing a concrete pavement level with the surface of the ground, and forming a partial roofing over the local tracks at this point. The abutting property on each side covered by the easements comprises strips from the back yards.

In order to secure the greatest benefit from the easements granted, the retaining walls, which have a width at the base of 7 feet 6 inches to 8 feet 3 inches, and an average height of 18 feet 9 inches, are built with concave surfaces, sufficiently recessed to add about 12 inches clearance from the railroad's original right of way line, thus giving the cars a total clearance of 3½ feet. The walls consist for the most part of plain concrete, with reinforcement at special points where it is needed. They are stepped up at the back to a width of 2 feet at the top, so that with the back-filling replaced the actual width of easement used, from the right of way line, is 2 feet between stations. The walls are provided with manholes, 400 feet apart, and have been provided with vitrified clay conduits aggregating 2 feet 5 inches high by 9¼ inches wide. The walls are surmounted by a picket fence 5 feet high.

Stations in Open Cut.

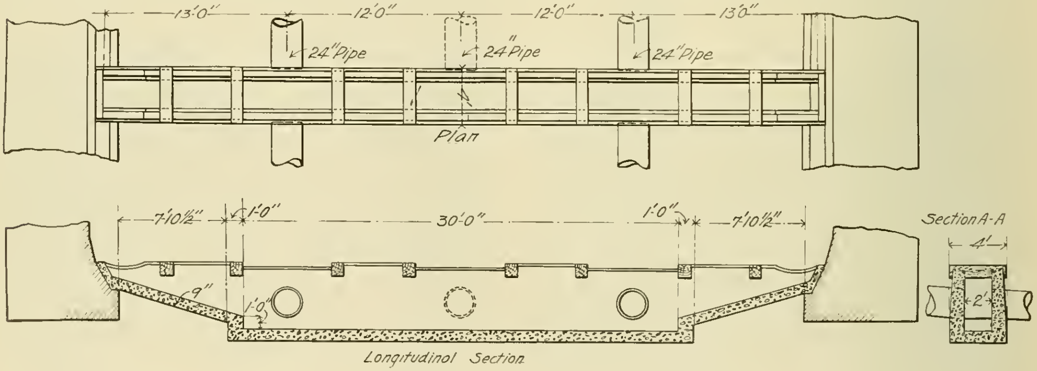
In the open cut there are local stations at Beverly road and Avenue C. These are of decidedly novel design, each consisting of a recess in the retaining wall, made without increasing the width of the easement. These stations are 300 feet in length, and have concrete platforms 8 feet wide. At the points where the wall space is occupied by a local station, the construction of the wall is varied to suit the occasion, being built as a straight wall 2 feet 2 inches thick, with a base to the height of the station platform 4 feet 5¼ inches wide, and having a reinforced concrete canopy supported by structural steel posts resting on concrete foundations, spaced 12 feet on centers. These platforms extend into the wall 5 feet 8¼ inches from the right of way line, and project, as do the canopies over them, 2 feet 5⅜ inches, to serve the local tracks.



Brighton Beach Line—Half Cross-Section of Paving for Highway Bridges.

Methods Used for Open Cut Work.

The contract for the open cut work was awarded to Mr. Charles Cranford, who also contracted to make the fill as far as that could be done by using the earth excavated from the cut, which is about to Avenue O. Mr. Cranford also builds the bridge abutments to Avenue O. The difficulties of the contractor were increased by the fact that it was necessary for the company to continue the operation of trains while the work was in progress. To accomplish this permission was obtained from the property owners to operate over the easement and the tracks shifted to permit the work to proceed. A trench was then dug along the west right of way line and the retaining wall constructed before attempting to excavate with the steam shovel.

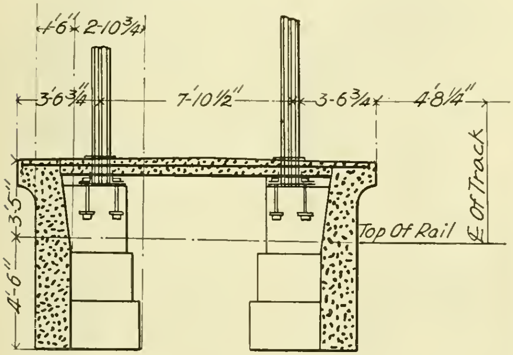


Brighton Beach Line—Plan and Section of Transverse Drains Under Roadbed.

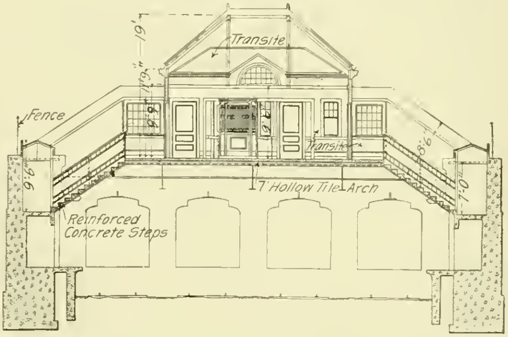
At two or three points special difficulty was encountered in building the retaining wall, by reason of the close proximity of adjoining buildings to the right of way line. It was necessary to shore up the structures, and in one instance the building wall was given a foundation on the retaining wall. Dirt was then excavated for a sufficient width to make room for one track and operation will be continued on this track while the remaining excavation is in progress. This excavation will be preceded by the construction of a trench, and the building of the east retaining wall in a manner similar to that in which the work on the west side was done. The excavation will then proceed by the agency of a steam shovel, having a switch track on either side of it, the two converging immediately behind the shovel into a single contractor's track in the bottom of this cut. This arrangement will enable the contractor to load earth into a car on one side of the steam shovel while the car on the other side is being switched out and replaced by an empty. The operating tracks, when finally laid, will be placed 12 feet apart. center to center. The roadbed will be of standard type, with cinder fill.

One of the interesting features of the work in the cut developed at Foster avenue, where the grade line intercepted the upper part of a city sewer of brick, having an inside diameter of 10 feet. It was necessary to reconstruct this sewer. The sewer was demolished to the level of the normal flow, and was then rebuilt with concrete. the original base being maintained, and a 4-inch brick lining being continued up to a height of 3 feet above the normal flow. It was widened and flattened. In order not to reduce the capacity of the sewer, the latter though reduced in height about 2 feet was widened to 14 feet 6 inches, and provided with an outside concrete wall 3 feet thick. The sewer was capped with a reinforced concrete top, the reinforcement consisting of 1-inch rods 19 feet long, spaced 6 inches on centers, and was further reinforced under each retaining wall by six 20-inch 65-pound I-beams 19 feet 6 inches long, spaced 12 inches on centers, and also by additional I-beams under the abutment. In order to secure the full benefit of the headway gained by lowering the top of the sewer, a special form of structural steel gutter for carrying the rails was sunk in the concrete, thus bringing the top of the rail flush with the top of the concrete covering the sewer.

Both the local and express stations will span the cut. As shown in one of the illustrations, these stations are of fireproof construction, employing transits for wall panels. Each station comprises a waiting room 25 feet by 24 feet 9 inches in extreme dimensions. Entrance and exit is had through doors at the street level. From the waiting room concrete steel stairways lead to the local platforms on each side. At express stations these stairways will be located in the central portion of the building, so as to reach the island platforms.



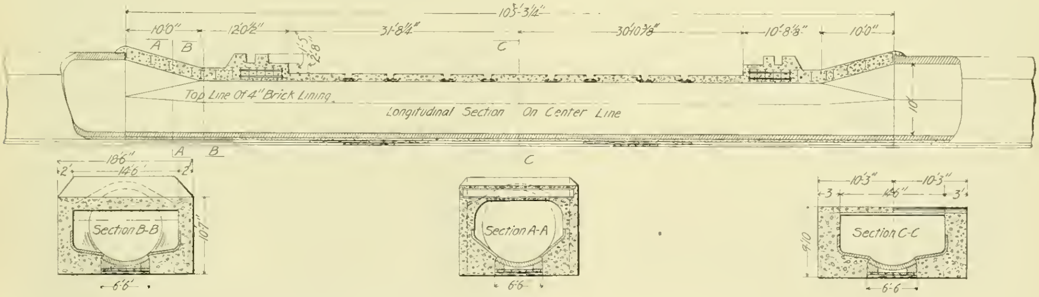
Brighton Beach Line—Cross-Section of Island Platform.



Brighton Beach Line—Typical Local Station over Tracks in Cut.

Grade Elevation.

That portion of the grade elimination which was accomplished by the earth fill, and by carrying the track over the streets on through girder bridges is notable in the amount of concrete abutment work provided. This feature is especially emphasized by the fact that in the elimination of grades on the Bay Ridge line of the Long Island Railroad the tracks of the latter will be shifted somewhat from their present position, and made to parallel closely the Brighton Beach line on an adjoining embankment, and concrete abutments, being in harmony with those built by the Brooklyn Heights Railroad Company, will appear to be a continuation of the latter. During the process of construction the tracks will be carried over the streets on temporary wooden bridges, which will be replaced with steel girder structures. The stations on the embankment section will also be entered from the street level, and the island platforms will be reached by stairways, leading directly up to them. The station at King's Highway is built under the tracks in the form of a recess in the concrete abutment. The right of way on the embankment section is in most places sufficiently wide to make it unnecessary to build retaining walls, except at express stations where it is necessary to make room for the island platforms by increasing the track room.



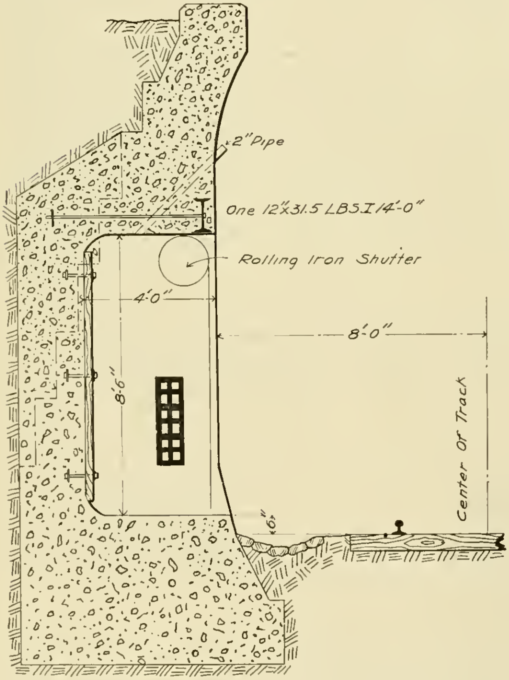
Brighton Beach Line—Reconstructed Sewer at Foster Avenue.

Concrete and steel work are employed in an interesting way at Neck road, Shore road and Neptune avenue. At Neck road an incline is provided by means of which one track leaves the embankment on the west side and passes under the Brighton Beach line and the Long Island Railroad, and one leaves on the east side making a double-track incline to the Sheepshead Bay racetrack. At Shore road there are special abutments for the long skew bridge, crossing both Shore road and East Fifteenth street at the point where the tracks curve to the west, and where the express station platforms also make it necessary to increase the width of the track space by special retaining walls. The necessity of crossing Neptune avenue at the point where the latter crosses a branch of Coney Island creek, make necessary an elevated steel structure about 500 feet long, resting on concrete piers, having a pile foundation. This viaduct will extend over East Twelfth street, Neptune avenue and the boulevard to a point about 350 feet south of Neptune avenue.

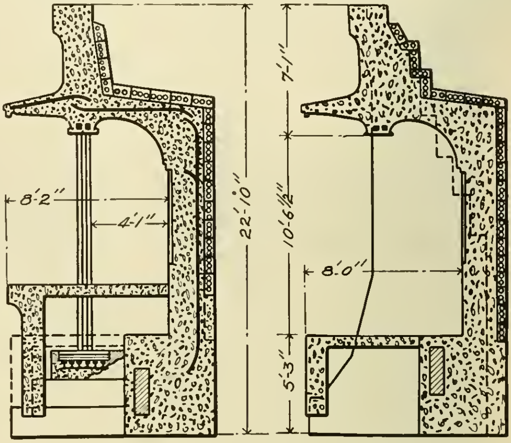
At a point near Avenue H, where the Brighton Beach line has heretofore passed underneath the Long Island Railroad this condition will be reversed and the Brighton Beach line will pass above the Long Island. During the progress of the work on the embankment section of the Brighton Beach road the trains of the latter are being detoured from a point near Avenue H over the Long Island tracks to Brighton Beach.

Waterproofing.

The waterproofing of the concrete work on the Brighton Beach improvement is of especial interest, owing to the great amount of concrete used. The specifications provide that at stations on the depressed section, the back of walls in the rear of platforms, the station canopies and parapet wall on the station canopies and bridge abutments shall be waterproofed as follows: After the excavation for the retaining walls is made, the contractor will erect a back wall of hollow brick, one brick thick, for the length of the section to be waterproofed. The inner face of this brick wall will be swabbed over with hot, melted "medium hard" coal tar pitch, of a somewhat softer grade than used for roofing purposes, or such as will soften at a temperature of 60 degrees F. and melt at a temperature of 100 degrees F., being a grade of pitch in which distillate oils, distilled therefrom, shall have a specific gravity of 1,105. This pitch will be swabbed over the surface of the brick wall until it has a uniform thickness over each part of not less than ⅛-inch. Against this will be laid a covering of single-ply waterproof Hydrex felt, supplied by the Hydrex Felt & Engineering Company, with the strips running vertically, each strip to be continuous from the top to the bottom of the wall, and with a lap of at least 12 inches. Immediately after laying the first layer of felt there will be again mopped or swabbed over the surface another uniform coating of hot pitch, and while the latter is still hot and soft a second layer of felt will be rolled and pressed into the pitch coating, with joints lapping and breaking joints with the first layer of felt. The whole will then be finished with a third coating of pitch. In front of this waterproof wall the concrete wall will be constructed, especial care being taken not to puncture or otherwise injure the waterproofing in ramming the concrete against the waterproofing wall. When the concrete wall and canopy with coping wall have been constructed, there will be spread a coating of hot pitch on the upper surface of the canopy and the rear surface of the coping wall. On this layer of hot pitch will be laid a layer of felt, as specified for the vertical wall, well lapped over the back waterproofing wall. On this Hydrex felt will be swabbed a second layer of asphalt, into which will be rolled and pressed a second layer of felt well lapped over the rear waterproofing wall and breaking joints with the first layer of felt. On this a third coat of hot pitch will be evenly spread. The felt waterproofing of the coping wall on the canopy will be flashed into the coping.



Brighton Beach Line—Standard Manhole in Retaining Wall.



Brighton Beach Line—Sections through Local Station Platforms.

One inch of Portland cement mortar will then be plastered with plasterer's trowel over this completed waterproofing to protect it from injury from the backfilling.

The contract for the steel work on both the depressed and elevated section was awarded to Milliken Brothers, of New York City. On the section below Avenue O the Brooklyn Heights Railroad Company undertook the work at unit prices for concrete excavation and fill at a maximum rate per yard. The contractor for the excavation and piling at Neptune avenue is Mr. Boit Cronin. The fill is being furnished by Mr. W. H. Galiagan from the adjoining Bay Ridge improvement of the Long Island.

A Railroad Defined.

What is a railroad? The Century Dictionary defines it as "A road upon which are laid one or more lines of rails to guide and facilitate the movement of vehicles designed to transport passengers, freight, or both."

That is a good, broad description and will doubtless satisfy American engineers. On the other side of the water, however, the definitions built by irresponsible and unlicensed dictionary makers are not sufficient. The supreme court of Germany lately gave an official definition of the word "railroad," which is quoted in full by our German contemporary, "Stahl und Eisen," with an appreciative reference to its clearness and terseness.

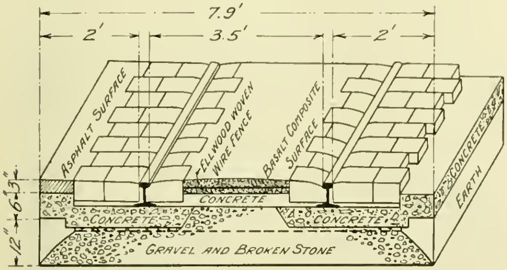
As some of our readers may be interested to see what a railroad looks like to the official German mind, we have been at the pains to translate this definition into English, giving as nearly a literal rendering as is possible. The result follows:

> "A railway is an enterprise projected for the repeated carriage of persons or things over not inconsiderable distances on metallic base which in point of consistence, construction and evenness is designed to make possible the transportation of large masses or a relatively high speed of transit, and which through this characteristic, combined with the associated motive power (steam, electricity, animal or human muscle power, or in a railway of inclined surface the mere weight of transportation elements and lading, etc.) is enabled, in the operation of the enterprise upon it, to produce a relatively tremendous effect, according to circumstances a useful effect as intended or one destructive to life and injurious to health."

We guarantee that no clearness has been sacrificed in making the translation, and that at the same time the above rendering maintains all the conciseness of the original. The English sentence contains 113 words, as against 115 in the German original.—Engineering News.

REINFORCED CONCRETE PAVING IN DENVER.

The accompanying line drawing shows the component parts of the standard roadbed of the Denver City Tramway. The section shown is taken between two ties. The subgrade consists of a bed of gravel and broken stone which supports the ties and is brought up in the center of the track to the level of the base of the rails. A 5-inch layer of concrete is placed between the ties under each rail and for two feet outside of the rails. This concrete bed supports the street pavement. The toothing blocks placed adjacent to the rails are made of basalt, which is a very hard rock of volcanic origin found at the terminus of one of the company's suburban lines. The rock weighs 188 pounds per cubic foot and includes a large per cent of aluminum. The larger portion of the paved streets of Denver have an asphalt surface. The space between the rails, however, which is paved and maintained by the Tramway company, has a basalt composite surface with beveled blocks of similar material to those on the outside of the rail. The use of this composite surface reinforced with wire and used as pavement is thought to be unique with this system. The spalls which accumulate in cutting the toothing blocks are crushed so that the largest pieces will pass through a 2-inch ring. Six parts of this material with three parts of sand and two parts of cement are mixed with ordinary concrete and tamped into the space between the beveled blocks. In this mass of concrete is embedded wire fencing of the "Ellwood" type, in which the wires are so woven as to take the form of connecting triangles, thus affording a good anchorage in the concrete. The concrete is tamped wet with its upper surface at a height sufficient to make a smooth joint with the beveled blocks. After this composite surface has been allowed to set it offers an extremely permanent form of pavement which has not been expensive to build.



Denver City Tramway—Track Construction in Asphalt Paved Streets.

Denver City Tramway—View in Front of Car House Showing Reinforcement in Basalt Composite Street Surface.

The half-tone illustration shows the method of placing the woven wire in such pavement as used in front of a car house. As regards durability it is interesting to note that this type of street surface was placed at a track intersection at one of the street corners of Denver six years ago, and although no wire was used to prevent cracking the pavement remains firm while the paving blocks near by have been badly worn.

CAR WINDOW SUGGESTIONS.

When one makes an attempt to open a car window he usually goes at the task with doubt in his mind as to whether he can move the sash easily or will be obliged to make a struggle with it and then be unsuccessful. There are reasons for window troubles and some suggestions as to remedying them may be of value.

A car may leave the shops of the builder in apparently good order as far as the working condition of the windows is concerned, the sash being properly constructed with ample clearances for free operation. However, when its destination is reached after a trip in wet weather or when the sun has warmed the exposed parts, the wood of which the frames are made invariably swells, the clearances disappear and a binding of the entire sash is the result. If the car builder in designing the windows allows sufficient clearance to accommodate this uneven swelling he will find that in the dry spells after the moisture has been absorbed, the wood will shrink and the sash thus become loose and rattle in the runways.

It is in this dried-out condition that the sash are raised during the summer months. The bolt of the sash lock, which is ordinarily round in shape, rests on the stop pieces attached to the casings. Having an extremely narrow support and with frequently a weak spring in the lock, a continued longitudinal jarring of the car body in starting and stopping tends gradually to work the bolt off the stop and let the sash drop.

The first step toward a remedying of this condition is the selection of proper woods for both sash and stop casings. Ordinarily the woods used for making sash frames are ash or birch and in more expensive cars, cherry and mahogany. The outer stop casings is usually of ash and the inner casing of the same wood as the car interior. The finer the grain of the wood the less moisture it will absorb and consequently those woods used in the construction of the more expensive cars are preferable. Apple-wood makes an ideal sash, but being hard to obtain, is frequently too expensive for consideration. Cherry seems to be the most desirable, since it is closed grained, of a variety of shades, inexpensive and is most susceptible to various stains.

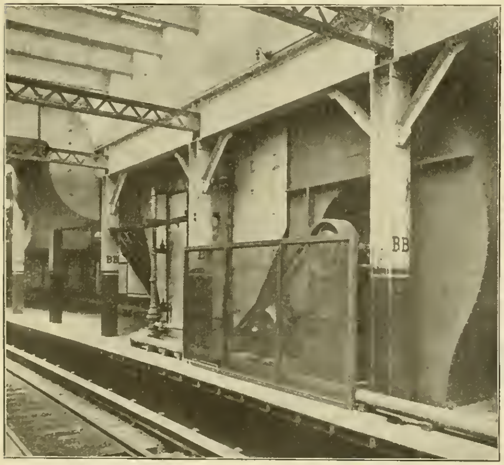
The outer stop casings should also be of cherry or other close-grained wood and should possess wearing qualities fully equal to those of the wood in the sash. The inner stop casing receives little or no friction from the operation of the sash and can be of any desired wood as selected for the interior of the car. Proper clearances should be provided for the free operation of the sash, between the sash and the post not more than one-eighth of an inch and between the sash and the stop casings not less than one-eighth of an inch. Thus, under any and all conditions, ease of operation of the sash is assured. When the sash is not being moved it should be firmly held in position against the outer stop casing. This will serve to exclude dust and cold air from the car interior and might in some cases do away with the necessity of providing double sash for winter use. When sash weigh over 20 pounds they become too heavy to lift and should be balanced.

Careful attention should be given to the location of the sash at its upper position. It is unpleasant for passengers to sit with the bottom rail of a window in a direct line with the eye. If the construction of a car is such that its height of top plate limits the lift of the sash so that the bottom rail will obstruct the line of vision, it might be a good plan to block the sash and prevent it from being raised above the desired limit. At the same time the lift should not be less than 10 inches, which opening will provide an emergency exit for the passengers in case of accident.

EXPERIMENTAL COOLING SYSTEM IN THE NEW YORK SUBWAY.

Experiments which have been made in the complicated problem of ventilating the New York subway and cooling the subway air in warm weather have so far been productive of results that appear to be satisfactory in the areas affected by the installed apparatus. In accordance with general recommendations made by Mr. George S. Rice, chief engineer of the Rapid Transit Railroad Commission of New York, by which it was proposed to accomplish a complete change of air in the subway every 30 minutes, openings were cut and 6,200 square feet of gratings installed in the vault lights over the stations from Brooklyn bridge to Ninety-sixth street, inclusive, and 14 ventilating chambers were built between stations from Brooklyn bridge to Columbus Circle. The latter are built as louvre and fan chambers, the automatic louvres being continuously in operation, and the fans, motor-driven, serving as auxiliaries in exhausting the air at night during the three months of hot weather or in time of emergency.

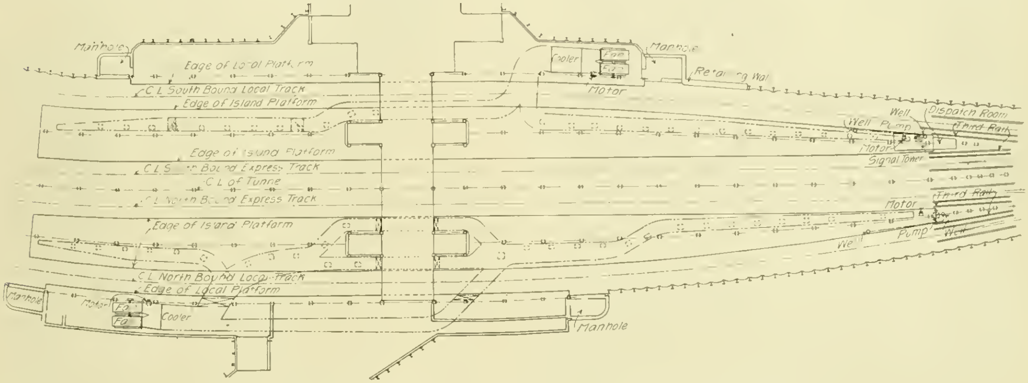
An interesting experimental plant has been installed at the Brooklyn bridge station. This was built in accordance with the original plans submitted to the chief engineer of the Rapid Transit Railroad Commission by Mr. J. E. Starr, of the Starr Engineering Company, New York. It consists of two units, one on the east and one on the west side of the station. Each unit consists of two artesian wells, from which water is pumped by a Deane triplex double-acting pump through a cooler consisting of a bank of piping situated on the unused local platform upon each side. The pump is driven by one C. & C. 40-horsepower direct-current motor, running on a 625-volt circuit. The bank of piping is enclosed in a galvanized iron casing, which has an inlet at one end, connected to the discharge of two fans installed by the American Blower Company, New York, which deliver about 75,000 cubic feet of air per minute for each unit, or 150,000 cubic feet per minute for the entire station. The blowers take air directly from the inside of the station and are driven by a motor similar to that used for the pumping system. The other end of the pipe chamber is connected with galvanized iron ducts leading over the station platforms. These ducts have grated openings about 20 by 28 inches, which discharge directly downward toward the platforms. The current of water is in counter direction to that of the air.


Cooling the New York Subway—Blower Fan and Air-Cooling Equipment at Brooklyn Bridge Station.

Cooling the New York Subway—Grating in Vault Lights at Bryant Park.

The plant was started on August 29, and was run continuously into October of the present year, and intermittently as required since. It was originally planned to use 400 gallons of water per minute, but when the wells were sunk it was found that the level of the water was lower than expected, and rather than lose time in lowering the pumps to the bottom of the station, it was decided to place them upon the platform level, from which point only about 200 gallons per minute were obtained altogether. A larger supply might have been obtained at the platform level, but it was deemed unwise to raise the speed of the pumps on account of the danger of losing suction at times and injecting air into the piping. Moreover it was considered that the 200 gallons were sufficient to maintain a comfortable temperature in the station under the conditions existing at the time of the experimental operation. The original recommendation was that sufficient apparatus be installed to handle 150,000 cubic feet of air per minute, and cool it to the amount of 15 degrees F.

The two fans forming part of each unit and operated by the same electric motor pass air through the cooler, which is approximately 9 feet wide, 12 feet 6 inches high and 10 feet long. This cooler forms a chamber, having for its top the roof of the subway, its bottom the platform, one side the side-wall at the end of the local platform, and its other side a galvanized iron partition placed inside the line of columns on the platform. The air passes through the cooler at right angles to a system of pipes placed on 3-inch centers, as shown in detail upon the engraving herewith, which are placed in rows staggered to 1½-inch centers. Each unit consists of about 21,000 feet of 1-inch pipe. As before stated, the fans take air directly from the volume of air in the station, including such air as is drawn in at the passenger entrances by the action of the trains and ventilating chambers on each side of the station. From each cooler the duct, after passing overhead of each island platform near the center, branches north and south toward the ends of the platform. The damper openings are spaced on about 10-foot centers, so arranged as to provide an even distribution of cooled air.



Cooling the New York Subway—Plan of Air Ducts at Brooklyn Bridge Station.

The general arrangement of the apparatus at the Brooklyn bridge station is shown in the accompanying diagram, from a blue-print showing the principal features.

On October 19 a test was made under the direction of Mr. Starr and of Mr. D. L. Turner, of the chief engineer's executive staff. The principal features of this test are detailed in the following account, furnished through the courtesy of Mr. Starr and the chief engineer of the Rapid Transit Railroad Commission:

TABLE I.

	FIRST PERIOD. —10 a. m. to 4 p. m.— Average W. Side.	Average E. Side.	Average Both Sides.	SECOND PERIOD. —4 p. m. to 6 p. m.— Average W. Side	Average E. Side	Average Both Sides.
Gallons of water per minute	110.00	91.90	201.90	105.20	88.70	193.90
Pounds of water per minute	917.40	766.46	1,683.80	877.36	740.13	1,617.50
Cubic feet of air per minute	72,400.00	73,200.00	......	73,980.00	73,800.00	147,780.00
Temperature of air inlet to fans	81.3	83.12	82.21	83.04	85.	84.02
Temperature of air outlet from fans	73.89	75.1	74.49	75.	75.5	75.25
Range of air	7.41	8.02	7.72	8.04	9.5	8.77
Temperature of water inlet to coils	61.1	61.1	61.1	61.1	61.1	61.1
Temperature of water outlet at coils	75.1	76.68	75.64	76.	77.57	76.78
Range of water	14.	15.18	14.54	14.9	16.47	15.68
Temp. of air on platform in the "flow" under gratings	76.8	79.5	78.15	77.9	81.	79.45
Temperature air platforms not in the "flow"	80.7	81.9	81.3	81.9	82.8	82.35
Average temperature of platform	78.7	80.7	79.7	79.9	81.9	80.9
Humidity, platform, per cent	68	69.	68.5	68.	64.	66.
Outside air temperature	86.6	86.6	86.6	85.4	85.4	85.4
Outside air humidity, per cent	60	60.	60.	60.	60.	60.
Air in "flow" on platform under outside air	9.8	7.1	8.45	7.5	4.4	5.95
Average air on platform under outside air	7.9	5.9	6.9	5.5	3.5	4.5
Highest temperature of outside air, 12:20 p. m	88.3	83.3	83.3	......	......	......
Average platform temperature, 12:20 p. m	78.7	80.2	79.45	......	......	......
Difference	9.6	8.1	9.85	......	......	......
Highest temp. of outside air, second period, 4:50 p. m	......	......	......	86.2	86.2	86.2
Average temp. at 4:50 p. m. on platform	......	......	......	79.8	81.2	80.05
Difference	......	......	......	6.4	5.0	5.7

At the time the test was made the outside temperature ranged from 85 to 90 degrees. The test was made continuously from 10:30 a. m. to 6 p. m., and the readings were taken at intervals of 10 minutes for certain portions of the data, and at 15 and 30 minutes for other portions, according to the necessity of including every fluctuation. The summaries of these various readings are shown in the accompanying tables, which divide the record into two periods, the first running from 10:30 a. m. to 4 p. m., when the train movement was comparatively even, and a second period, including from 4 p. m. to 6 p. m., during the time of increased train movement. The tabulation of the results shows that although the outside temperature was lower during the second period, the station temperatures were higher, on account of increased train movement.

In the report from which these data were taken the author calls attention to some of the relations disclosed by the table. During the first period the temperatures tabulated as "in the flow," indicated that persons standing on the platform under or near the gratings were in a current of moving air at a temperature of 76.8 degrees on the west platform, or 9.8 degrees below the outside air. This flow of air was perceptible for a distance of five or six feet radius from a point on the platform below the center of the grating, and as the gratings were spaced, as before stated, on about 10-foot centers, the flow areas overlapped. On the east platform the temperature of air in the flow averaged 79.5 degrees, or 7.1 degrees below that of the outside air. In other places on the west platform, where the air was not in so rapid motion, the temperature was 80.7 degrees, and on the east platform 81.9 degrees, while the air on the street was 86.6 degrees. At all points on the platforms, however, it is stated the air was in fairly rapid motion. The fact that the change in temperature was perceptible is indicated by the lining up of passengers in the zone of the more swiftly moving air.

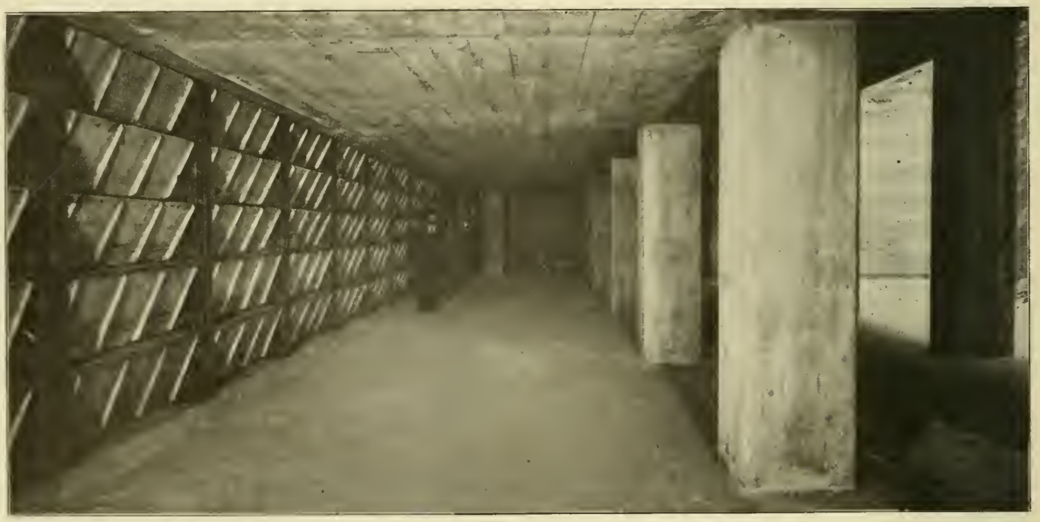
The humidity on the platform ranged from 64 to 68 degrees, and this was considered a satisfactory result.

The entire effect of the system of ventilation is not shown by the comparison between the outside temperature and the inside temperature, but the comparison should be made of the temperatures that would have obtained under the same conditions of outside temperature with and without cooling. From records in the possession of the chief engineer's office it was shown that on July 19, 1905, between 4 and 6 p. m. the outside temperature averaged 84.1 degrees, while the temperature of the Brooklyn bridge station averaged 91.1 degrees, the station air being 7 degrees higher than the outside air. In this test, during the same hours, the outside air averaged 86.2 degrees, while that of the station averaged 80.8 degrees, or 4.5 degrees below the outside air. During this test the ventilating chambers on each side of the bridge station were in operation, and by reason of their operation air was being drawn in at the bridge station and taken care of by the cooling apparatus. How far the cooling of the air at the station affected the temperature of the subway on each side of the ventilating channels was not investigated. The test was not conclusive of the amount of cooling that could be effected with a full supply of cooling water as originally calculated. The intention was that 150,000 cubic feet of air could be taken in at 90 degrees and cooled to 75 degrees by the use of 400 gallons of water.

TABLE 11.

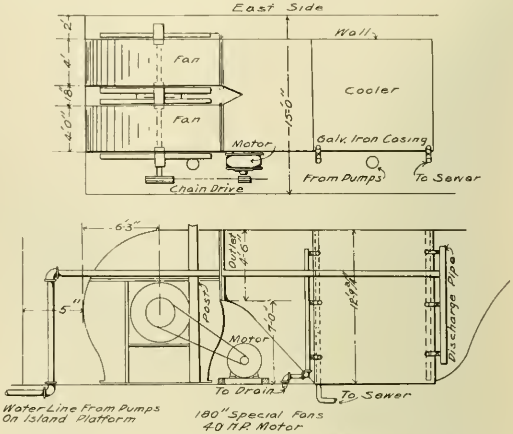
Showing rate of heat transfer per square foot per degree difference of mean temperatures.

	West Side.	East Side.
Pounds of water per minute	917.4	766.4
Range of water, degrees	14.	15.08
British thermal units, per minute	12,843	11,557.
British thermal units, per hour	770,580.	693,420.
Mean temperature of water	68.1	68.59
Mean temperature of air	77.59	79.11
Difference of means	9.49	10.52
Heat transfer per hour per degree of difference	81.200.	65,914.
Surface	7.200.	7,000.
Transfer per hour per deg. difference per sq. ft.	11.3	9.4
Tonnage per day expressed in terms of melting ice, tons	64.2	57.8
Total tons	112 per day	



Cooling the New York Subway—View Showing Detail Arrangement of Louvres.

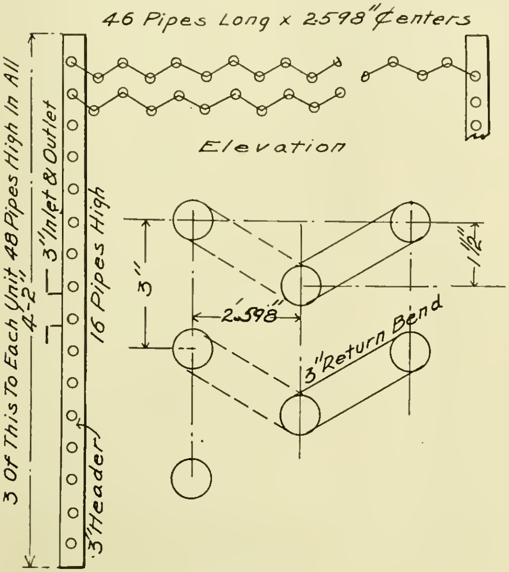
The results of the test indicate scarcely a doubt that the original calculation is a safe one. The figures were based on a heat transfer of 7.5 British thermal units per square foot per hour per degree of difference between the mean temperature of the air and that of the water. From the second table given herewith it appears that the actual results indicated that these were safe limits, as the actual transfer was between 9.4 and 11.3 British thermal units per square foot per degree of difference of mean temperatures, and the change of air was about 8 degrees on 200 gallons of water. It is therefore fully expected that a range of 15 degrees may be safely calculated upon, with a full supply of 400 gallons, with an initial temperature of 90 degrees, and a consequent wider difference of mean temperatures. During the preliminary tests observation showed that owing to the heat generated by train movement the temperature at this station at the inlet of the fans stands at about 78 or 79 degrees, even when the outside air is below that temperature. It is recommended on this account that an inlet duct be constructed to the fan from the outside air, and that this



Cooling the New York Subway—Plan and Elevation of Fans and Coolers.

be controlled by a damper automatically or otherwise regulated, so that when the outside air drops below 78 degrees the damper may shut off the suction from the station and turn on suction from the outside. In this way it is believed that station air can always be maintained at a temperature below that of the outside air down to about 70 degrees when the outside air is about 75 degrees. It was assumed that this will be as low a point as it is desirable to reach.

The results of this test have been so satisfactory that there is little doubt that the application of the system will be extended to other stations upon the subway.



Cooling the New York Subway—Piping Details for Air Cooler.

A Test of Municipal Ownership.

The municipality of Monroe, La., recently began the operation of an electric street car line. It is claimed that this is the first practical test of municipal ownership of street railways anywhere in the United States, and as a consequence the success of the enterprise will be watched with close attention.

Two years ago, following the success of the city's move in taking over the water and lighting plants, the city's charter was changed so as to permit it to operate and own a street railway system. The system as completed is first-class in its equipment and compares favorably with the street railways of other cities of the same size. In connection with the railway line the city has purchased for $40,000 a tract of 130 acres for use as a public park and fair ground.

It is now possible to travel from Manchester to Liverpool, England, by tramway car, and, although the ojurney occupies about five hours, several enthusiasts have already taken the trip on the completed line of the Lancashire United Tramways Company. With the exception of a break of a few miles, it is now possible also to travel from Liverpool to Leeds by tramway. The Lancashire United Company, by acquiring about 80 per cent of the shares of the St. Helens Company, new practically controls the whole of the tramway systems between Liverpool, Bolton, Wigan and Manchester.

SOME CAUTIONS TO BE OBSERVED IN SOLDERING.

BY ARTHUR B. WEEKS.

The too generous use of acid for soldering purposes on electrical machinery frequently leads to trouble and the following observations may be of assistance to some who have experienced difficulties from this source. It is, of course, possible to use acid safely and properly, but the majority of repairmen do not realize the dangers or are indifferent to the damage which may result from the use of too large an amount of soldering fluid.

An instance which came to the writer's knowledge may illustrate this argument: In repairing a railway generator a plentiful amount of acid was used in soldering the large flat armature leads. This commutator was very large and torches were used to heat copper for soldering. As is usual some connections were difficult to make and acid was used very freely at such joints, but after the work was completed and when the armature was tested for short-circuits a serious condition was shown. The repairmen thought that the short-circuits from bar to bar were caused by the acid and for that reason they dug into the mica segments with penknives, scratch-awls and saw-blades; but their efforts were in vain. In spite of not being able to locate the difficulty it was decided to try to operate the generator. For some time after the machine was started severe sparking resulted, but eventually the machine operated fairly well under light loads. However, with the throwing on of the regular load there was a flash on the commutator, leaving a large hole. This accident was so serious that it was then necessary to return the commutator to the factory for refilling.

In this case the troubles were occasioned by the excessive use of acid which was absorbed from the surface by the mica and carried farther in by the heat from the blow torches used in soldering. The acid attacks the copper and follows into the mica segments, then trouble begins to multiply. When commutator shells are taken apart and the interiors are found coated green this point is clearly illustrated.

In street railway repair shops the same soldering cautions are to be observed, because very often commutators live but one-half their rightful life and are too early condemned. Armatures nearly always accompany their commutators to the scrap heap. A testing set will at once locate short-circuits caused by the excessive use of acid, but I desire to prescribe the "ounce of prevention" rather than the "pound of cure."

Acid is now too freely used for soldering and a paste flux as a substitute will serve far better; it is cleaner to handle and has many less troubles charged to its use. Not all paste fluxes will answer for commutator work, as some are "too safe" and have an insufficient amount of acid in their composition. On new work nearly any paste will do, but on repair work there is a peculiar surface coating over the copper which very often can only be cleaned well with the stronger kinds of paste.

Nearly all roads have experienced difficulties from poor connections caused by careless soldering, and since so much depends upon the getting of the right heat, the use of good solder and the judging of the correct amount of acid, one should naturally use more caution, which commendable quality would do away with many of the present troubles. If the leads are tinned before being placed in the commutator slots they can be connected more satisfactorily, but where too much acid is then used the work of destruction continues. Zinc cut in muriatic acid is not suited for commutator work. There are several liquid fluxes now on the market, but for safe results none as yet equals rosin or a mixture of rosin in alcohol. But even with these good fluxes the pieces to be soldered must be absolutely clean.

The writer would suggest that those having troubles from the use of acid in soldering should collect a number of sample boxes of the various paste fluxes and experiment with them on copper wire The one best adapted for the particular needs of any shop will soon be found. In making these tests materials should be tried on old as well as new work. It is a good plan to make a number of joints with the various kinds of acids and lay them away for some time so that observations may be taken as to the amount of corrosion. These tests can be made at odd times and their results should more than pay for the time consumed in experimenting.

STANDARDIZATION OF DIRECT-CURRENT TRACTION MOTORS.

The following report of the committee on standards for direct-current traction motors was presented at the Milan convention of the International Tramway Association in September last by Prof. G. Kapp, of Birmingham University.

General.

1. The following rules should be observed when machines are offered for sale, and when the sale is effected, except where the seller and buyer by mutual agreement wish to modify them.

Definitions.

2. Rating.—The mechanical power developed by a motor or simply the power of the motor, is that power which is developed at the motor axle, in accordance with conditions as given below. (In certain special cases it may be desirable to know the power of the motor itself, exclusive of the gearing, axles, etc. In this case the word "propre" is added to each of the below-described methods of rating.) The continuous rating of a motor is that power which can be developed for 10 consecutive hours without undue heating, as prescribed in paragraph 6 on "Heating," the current being supplied at normal voltage. The normal rating of a motor is that power which would be developed for one hour without interruption, and without undue heating, as prescribed in paragraph 6 on "Heating," the current being supplied at normal voltage. The maximum rating of a motor is that power which can be developed for five consecutive minutes with practically no sparking at the brushes, the current being supplied at normal voltage.

3. Tractive Effort.—The tractive effort of a motor is the tangential force developed at the periphery of a wheel of specified diameter for a given gear ratio. (In the case of direct-connected motors the tractive effort will be that developed at the end of an arm 50 centimeters long supposed to be mounted on the motor axle.) The conditions under which this force is developed are set forth in paragraphs on "Acceptance."

4. Speed.—The speed of a motor is the peripheral speed of the car wheels produced when the chosen gear ratio is employed.

5. Efficiency.—The efficiency of a motor is the ratio between the mechanical power developed by the motor to the electrical power supplied to the motor terminals, the current being supplied at normal voltage.

6. Heating.—A motor is said to be overheated when, starting at an atmospheric temperature of 25 degrees C. it runs continuously for 10 hours at its continuous rating, or for one hour at its normal rating, and at the end of the specified period the temperature of the motor has exceeded that of the surrounding air by the following amounts: (a) Windings—cotton-insulated, 70 degrees C.; paper-insulated, 80 degrees C.; mica-insulated, or other substances having the same insulating and heat-resisting qualities, 100 degrees C. (b) Commutator, 80 degrees C. (c) The cores in which the windings are embedded should have temperatures corresponding to those given for the windings, according to the nature of the insulation. When the windings are insulated with combinations of the above given materials, the lowest temperature limit is taken.

Specifications.

7. The specifications should contain, in addition to the normal voltage, the following data, all referred to the normal voltage: (1) The continuous rating of the motor and the corresponding value of the current. (2) The normal rating of the motor and the corresponding value of the current. (3) The maximum rating of the motor and the corresponding value of the current. (4) The efficiency when running respectively at the continuous rating and at the normal rating, the temperature of the motor being taken as 75 degrees C. (5) The character of the insulating materials. (6) The over-all dimensions of the motor. The gear ratio for a given diameter of wheel, tractive effort and speed, both at the continuous and normal ratings must be given. Performance curves showing the tractive effort, the speed, and the efficiency of the motor plotted with current value must also be given. (In certain cases it may be desirable to know the heating and cooling curves of the motor when working at its normal rating and subsequently at other outputs, also those of the field coils and the armature coils when the motor is closed and at rest.)

Name Plate.

8. In addition to the above data contained in the specifications, each motor shall bear a plate giving the normal voltage, the normal rating, the speed, and the corresponding current value.

Construction.

9. The frame should be so constructed as to avoid magnetic leakage; it must be dust-proof, and also proof against water which might be thrown against it when in service. The frame must be fitted with openings which permit the maintenance of the brushes, said openings being hermetically closed. By maintenance of the brushes is not meant merely the renewal of the brushes, but also the renewal of the brush-holders.

10. The bearings should be so constructed as to prevent the introduction of oil or grease into the interior of the motor.

11. The motor, and notably the commutator and the brushes, should be so constructed that the motor will run equally well in either direction without changing the position of the brushes. The sparking should be practically nil for all loads below the maximum rating.

12. The insulation of the windings from the cores and frame should be such that immediately after the motor has attained its maximum allowable temperature it will be able to resist for five minutes an alternating voltage, the value of which is four times that of the normal voltage.

13. All parts of the motor which will be liable to be replaced, in particular the armatures, field coils, the armature coils, the commutators, etc., should be interchangeable—i. e., these parts should be replaced without incurring the least work outside of mere adjustment; the removal of the armature should take place without disturbing the brush-holders.

Acceptance Tests.

14. The acceptance tests shall be made before the motors are mounted on the cars. These tests consist not only in an examination into the general conditions of good manufacture and good construction, but especially in the determination of the power, the tractive effort, the speed, the efficiency, and the heating.

(A) Determination of the Mechanical Power.

15. The mechanical power of a motor can be determined with an absorption dynamometer, which may be in the form of an electric generator coupled directly to the motor axle. The efficiency of the generator must be known for each condition of load. The generator cannot be replaced by a traction motor similar to the one under test and driven by gearing.

(B) Measurement of Temperature Rise in the Power Tests of Motors.

16. The rating of a motor is determined, according to definition, by the temperature rise.

17. It is not permissible to take away, open, or modify the case, covers, etc., which should be left as they will be in actual operation. It is also not permissible to produce artificially the current of air which would be caused by the movement of the car.

18. The temperature of the surrounding air should be measured in each existing current of air; if any predominant current did not make itself felt, the mean temperature of the air surrounding the motor should be measured at the height of the middle of that current, and in both cases at a distance of about 1m. from the motor. The temperature of the surrounding air shall be taken at regular intervals during the last 15 minutes of the test, and the mean of the readings shall be taken.

19. In case a thermometer is used to measure the temperature, an attempt must be made to get the best possible conduction of heat between the thermometer and the part of the motor, the temperature of which is to be measured—for example, by means of a tinfoil coating. To avoid the radiation of heat, the thermometer wells and the parts of which the temperature is to be measured should be covered with substances which are poor conductors of heat (waste or similar material). A thermometer shall not be read until the mercury has ceased to rise.

20. The temperature rise of all parts of the motor, except the field coils, shall be measured with thermometers. Where possible the temperature should be measured at those points where it is greatest.

21. The temperature of the field coils should be determined by the resistance method. If the temperature coefficient of resistivity of copper has not been determined, it can be taken as 0-004.

(C) Determination of the Efficiency of Motors.

22. In determining the efficiency of a motor alone, or with its gears, the absorption dynamometer method can be employed, fastening the brake on the motor axle in the first case, and upon an auxiliary axle which will take the place of the car axle in the second case. It is also possible, by exercising proper care, to use purely electrical methods as outlined in the following paragraphs:

23. The combined efficiency of the motors and their gearing is determined by one of the two following methods. The described are not theoretically exact, because of the differences in the methods of connecting the two parts of the system; the error, however, remains within the permissible limits as long as the gear ratio is small.

(A) Two motors to be tested are coupled together mechanically by an auxiliary axle carrying a gear similar to the one on the car axle and engaging with the pinions of the motors. One of the motors should have the normal voltage, E, impressed across its terminals, and running as a motor will consume a power equal to E I, corresponding to the normal rating of the motor; the other motor will act as a generator, and will deliver a power equal to E I'. The power supplied and the power delivered being measured, the efficiency of one motor and its transmission will be

$$e=\sqrt{(EI'\div EI)}$$

As a check it is advisable to measure the power, E *i*, absorbed by the system:

$$E\,i=E\,I-E\,I'=I-I'.$$

(B) Two motors to be tested are coupled together mechanically by an auxiliary axle carrying a gear similar to the one on the car axle and engaging with the pinions of the motors. One of the motors should run as a motor and the other as a generator. They should be interconnected electrically so that the only power, P, taken from the external source will be that required to supply the losses. If the total power furnished to one motor is P_1 and the total power delivered by the other as generator is P_2, then $P = P_1 - P_2$, and the efficiency of one motor with its gearing is

$$e = \sqrt{(P_2 \div P_1)}$$

The quantities P_1 and P_2 should be measured directly and electrically. As a check it is advisable to measure the power, P, furnished the system to supply the losses.

24. In case it is desired to find the efficiency of motors intended to be coupled directly to the car axle, the above methods can be applied by coupling the motors directly together.

AUTOMATIC ELECTRIC BLOCK SIGNALING—ELECTRIFIED LINES LONG ISLAND RAILROAD.

During the past year the Long Island Railroad has installed and had in operation automatic block signals with alternating-current track circuits on its electrified lines. This system of signaling was designed and installed by the Union Switch & Signal Company.

The electrification of the road, using a third rail for delivery of the propulsion current and both of the running rails for the return of the propulsion current, which is direct current, made it necessary to instal inductive rail bonds. These separate the different track sections having alternating current impressed upon the rails for the signal track circuits and at the same time give a free path for the propulsion current. There are now, in all, about 19 miles of double-track road and 4½ miles of four-track road equipped with alternating-current track circuits and automatic signals of the motor type, with the exception of the two subways on Atlantic avenue, where an electric light signal is used. The lights in this signal are controlled by alternating-current line relays, which in turn are controlled by the track relays.

The electrified divisions of the road equipped with these signals include all of the four-track road and 12 miles of the two-track road mentioned, extending from Flatbush avenue in Brooklyn to Queens and from Woodhaven Junction to Howard. On the remaining seven miles of double track, from Rockaway Junction to Valley Stream, which has also been equipped with alternating-current track circuits for the signals, the inductive rail bond is not used, as this part of the road is not worked by electric traction. The alternating-current track circuit, nevertheless, was installed here for the operation of the existing system of automatic signals in this territory, on account of a third track on this division, which is electrified, and runs parallel with the two main tracks from Springfield Junction to Valley Stream.

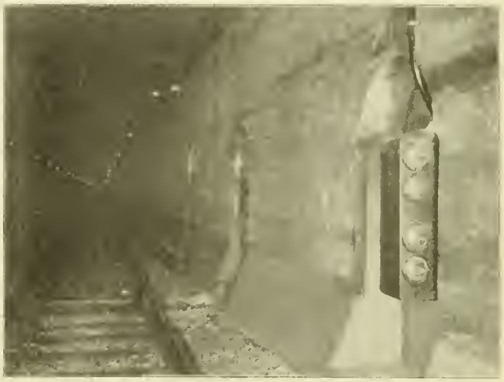


Fig. 1—Light Signal in Flatbush Subway.

The length of the sections ranges from 1,000 to 1,200 feet, with the transformers connected at one end of the section, and from 1,300 feet to 2,800 feet with the transformers connected in intermediate positions.

The motor signals used are of the Union Switch & Signal Company's standard style B type, of which there are installed or on order with this company a number in excess of 18,000. Current for the motors and the line relays is taken from two sets of storage batteries installed at every pair of signals and so arranged that one set is being charged while the other set is discharging. The charging current is taken from the third rail at 650 volts, through a high resistance so proportioned that just the necessary current flows

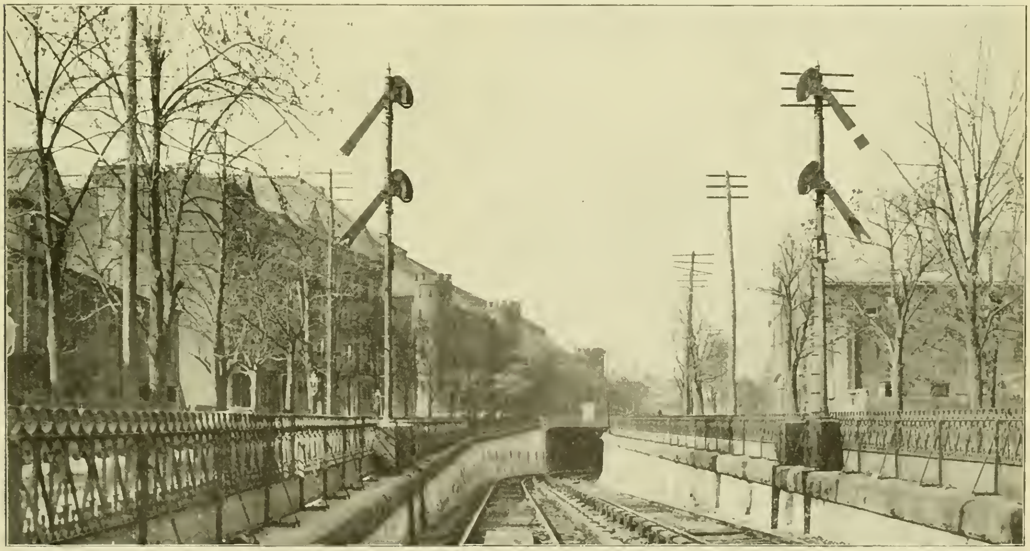


Fig. 2—Signals on Electrified Lines, Long Island Railroad—Subway Portal at Nostrand Avenue.

into the batteries. A 100-kilowatt transformer at Woodhaven Junction supplies the high-tension mains with the current at a potential of 2,200 volts and a frequency of 25 cycles.

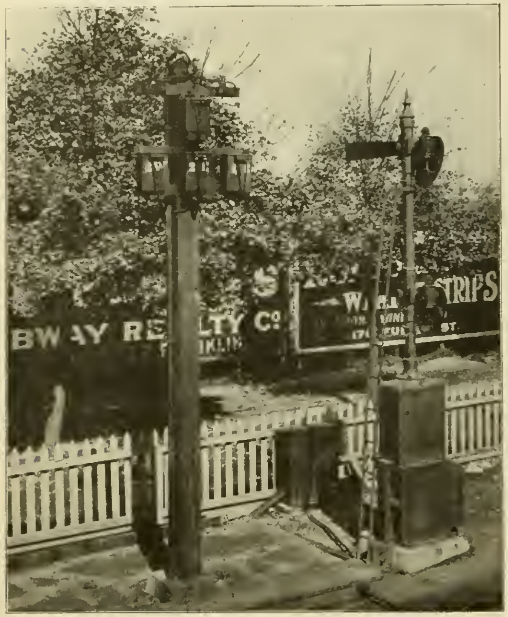


Fig. 4—Transformer Pole in Concrete Foundation.

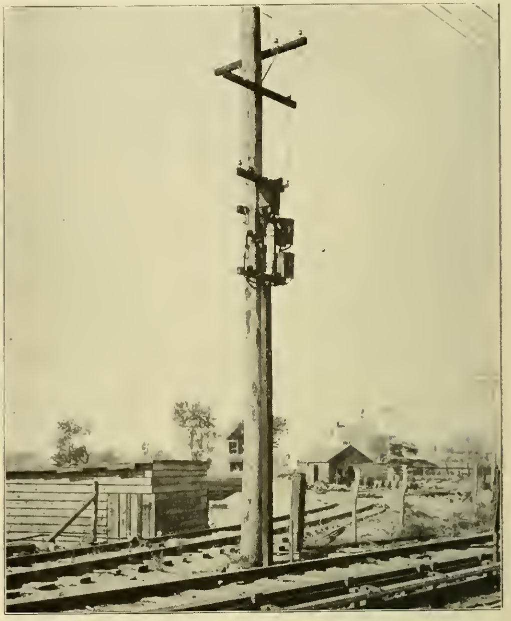


Fig. 5—High-Tension Transmission Pole Line.

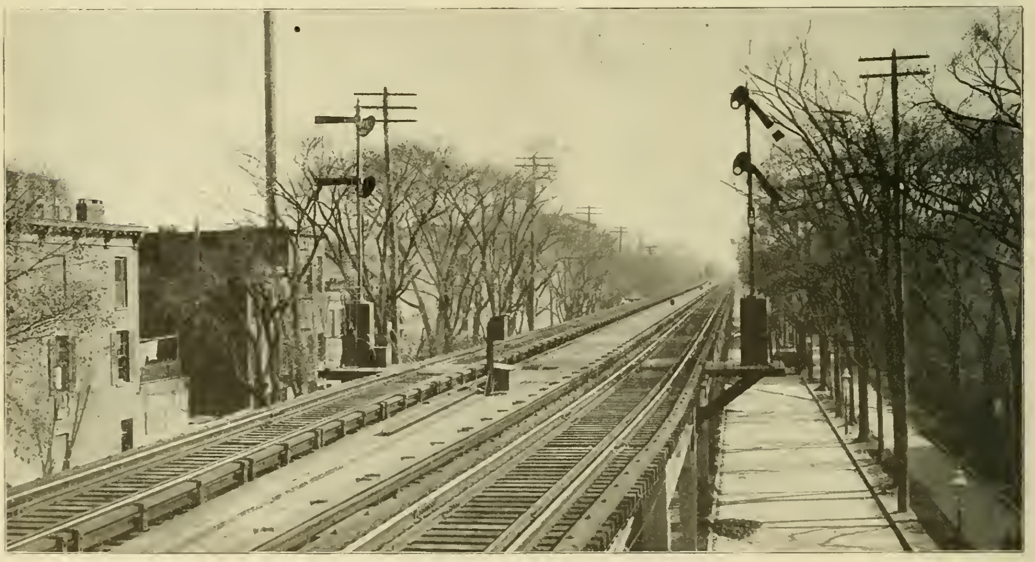


Fig. 3—Signals on Electrified Lines, Long Island Railroad—Elevated Structure East of Nostrand Avenue.

These mains are carried underground in a lead cable for a distance of about eight miles, from Flatbush avenue station to Dunton; from there on east to Queens and Valley Stream and from Woodhaven Junction to Howard the alternating-current mains are carried on the high-tension transmission pole line. From the alternating-current main taps are brought into the primary transformers where the potential is reduced to 55 volts. This is in turn reduced in another set of transformers, called the track transformers, to from six to two volts as the conditions of the different track sections require. In the subways the lights in the signals and all line relays are also supplied from the 55-volt side of the primary transformers.

The new interlocking plants to be installed in connection with the alternating-current track system are all in service, with the exception of four electro-pneumatic plants, two in the Flatbush terminal, one in the tunnel at Vanderbilt avenue and one at Carlton avenue, which will be put in operation in the very near future. The two 40-horsepower air compressors for these four interlockings are located at the Flatbush terminal, and are motor driven with automatic governors to keep the pressure within a certain range.

All dwarf signals and starters in these interlockings are electrically-lighted slide signals.

At Railroad avenue a Union electric interlocking with alternating-current indication circuits has been installed. The track circuits have been carried through this plant, the interlocked main-line signals being made semi-automatic.

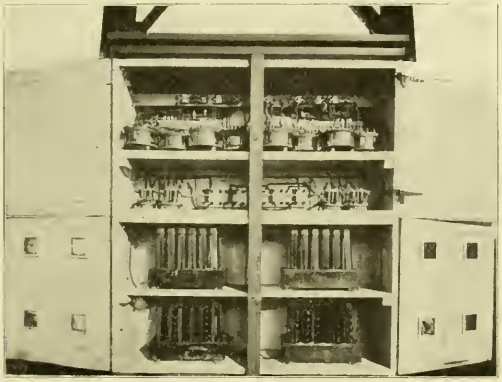


Fig. 7—Cupboard for Relays.

The east end of Jamaica passenger station and Rockaway Junction have also been equipped with electric interlockings of the same type. A number of existing mechanical interlockings and one electric interlocking plant had to be equipped with the semi-automatic arrangement of control for the signals within their limits, this being accomplished with alternating-current track circuits. These plants are located at East New York, Woodhaven Junction, two in Jamaica Yard, Springfield Junction, Valley Stream, Howard, and the electric interlocking at Ozone Park.

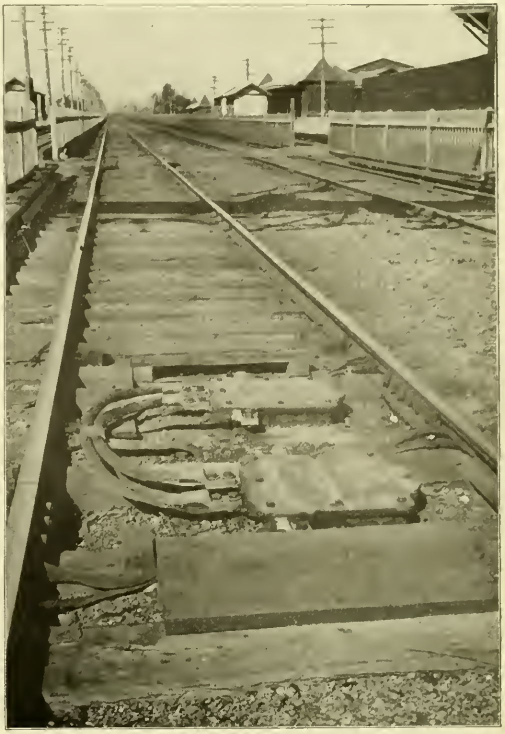


Fig. 9—Inductive Rail Bonds.

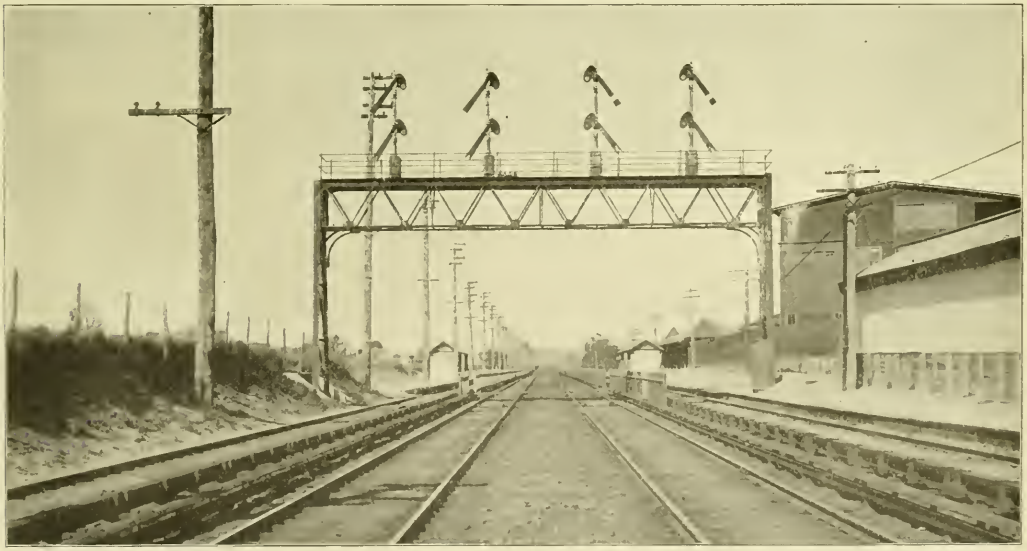


Fig. 6—Signals on Electrified Lines, Long Island Railroad.

In explanation of the illustrations: Figure 1 shows a light signal in the Flatbush subway. Figure 2 shows the subway portal at Nostrand avenue with east and west-bound signals mounted on the walls of the tunnel approach. Figure 3 shows the elevated structure east of Nostrand avenue station, with the signals set on supporting platforms. Figure 4 shows a transformer pole in concrete foundation, with high-tension tap from the alternating-current mains and arrangement of the primary transformer with its two fuse blocks and three track transformers beneath it. This figure also shows a two-arm semi-automatic west-bound starting signal at Woodhaven Junction. Figure 5 shows the high-tension transmission pole line, with alternating-current signal mains on the lower cross-arm, primary and track transformers mounted on the pole. Figure 6 shows the signal bridge for four tracks on the Rockaway Beach division at Aqueduct racetrack. Figure 7 shows the cupboard for relays and storage batteries, mounted in the leg of a signal bridge.

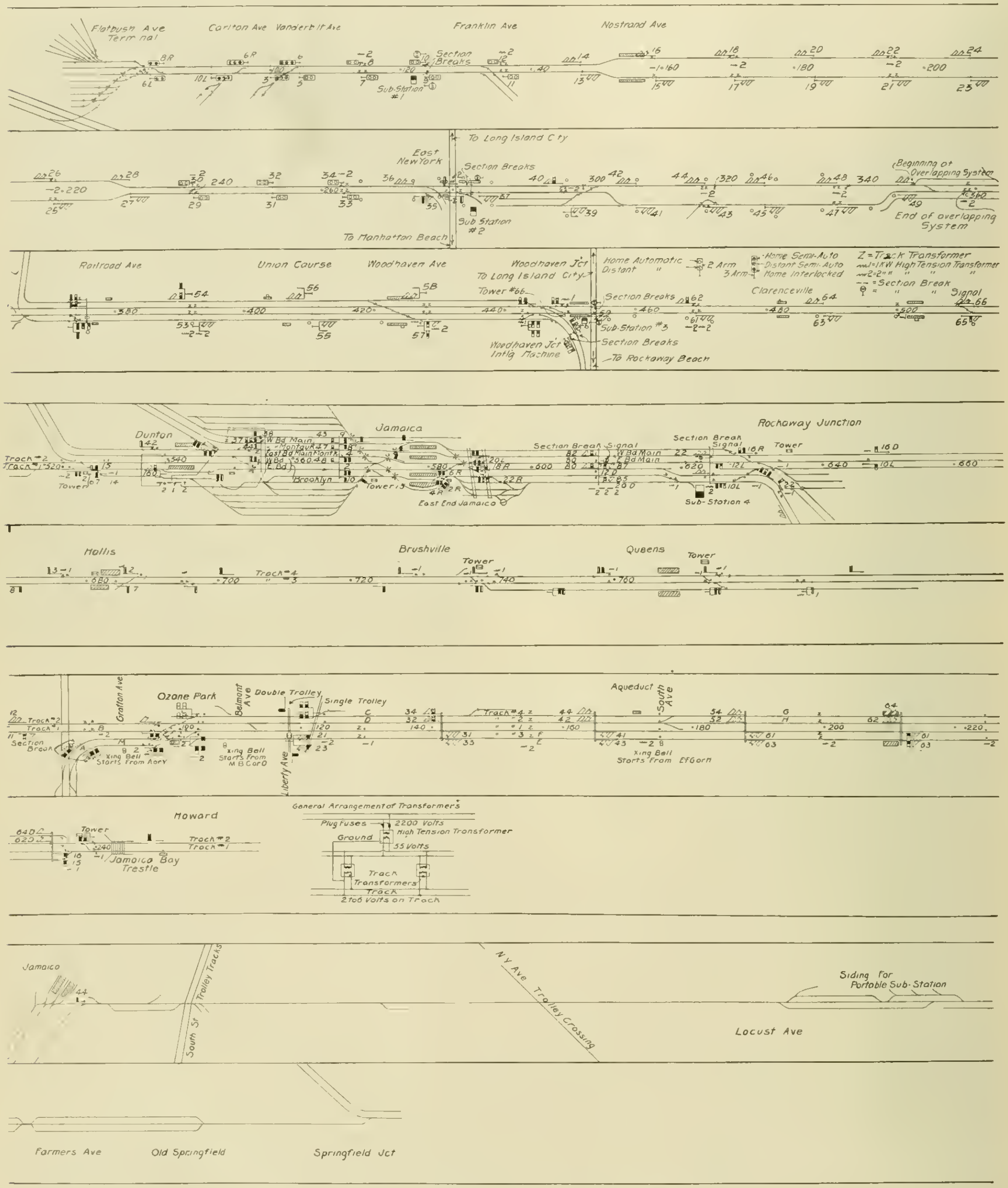


Fig. 8—Signals on Electrified Lines, Long Island Railroad.

Figure 8 shows a single-line diagram of the divisions here described. Figure 9 shows the inductive rail bonds uncovered.

The design and execution of this work involved unusual and very complicated conditions. The line included subways, elevated structures and surface lines; and the work had to be installed during the constant movement of a heavy traffic. This was successfully accomplished with practically no interruption of the regular operation of the road. The existing interlockings were modified and adapted to the new methods of control without putting them out of service.

The work was designed and executed under the supervision of George Gibbs, consulting engineer, J. R. Savage, chief engineer, and E. M Weaver, signal engineer, of the Long Island Railroad.

VARNISH.*

BY MR. J. H. PITARD, MASTER CAR PAINTER MOBILE & OHIO RAILROAD, WHISTLER, ALA.

Owing to the sensitive nature of varnish it is doubtless affected to some extent by agencies that cannot be controverted.

Of the effect of the different colors on varnish, experience has taught that the temperature of such colors is regulated by natural laws. In order to ascertain the relative heat-resisting qualities of the two extremes of colors, white and black, and also of the relative heat-resisting qualities of wood and iron, I recently conducted an experiment as follows:

Two panels each of wood and ¼-inch iron plate were painted, one each with black and white paint and exposed for several hours in the sun when the temperature was 96 degrees, and the shade temperature was 87¼ degrees. They were then removed to the shade and the bulb of a thermometer applied to each with the following results:

Black board	107½	degrees,
White board	98¼	"
Black iron	113	"
White iron	104	"
Sun temperature	96	"
Shade temperature	87	"

After allowing each panel to cool 15 minutes, the thermometer was again applied with the following result:

Black board	94	degrees.
White board	93	"
Black iron	96	"
White iron	93	"

It will be seen that the black iron reached the highest degree of heat, 113 degrees, which was 17 degrees of stored energy in excess of sun heat. The test further demonstrated that while the black iron cooled more rapidly than either of the other wood panels, it was longer in reaching the normal temperature owing to its excessive heat. As heat is known to be destructive to paint and varnish by robbing them of their fluids, and thus causing the gums and pigments to crumble, it is reasonable to suppose that the comparative extent of injury to the various shades of color, arising from this source is in proportion to the heat absorbing or the heat-resisting qualities of the various shades of colors upon which varnish is applied.

In order to further illustrate this point, it will be recalled that when yellow was the prevailing color for painting passenger equipment, its durability was a subject of common remark and is yet often remarked by the painters of the old school whose experience with both has doubtless convinced them of the superior durability of the yellow color as compared to the dark colors that have generally superseded them. But while admitting the superior durability of the yellow color, it can be said without possibility of contradiction that its superiority did not exist in any particular affinity that the yellow pigment possessed for the varnish by which it was protected, but rather in the heat-repelling qualities of the lighter color, thus deferring the burning up of the varnish to a more indefinite day.

Regarding the effect exercised upon varnish by the various pigments there are two possible sources of deterioration which some of the pigments present. One is the chemical antagonism resulting between pigment and varnish, in those pigments that are chemically produced, and from which the acids and other chemicals have not been thoroughly eradicated.

Another source of deterioration is due to the capillary action of pigments of coarse texture by which means the varnish fluids are absorbed, and the varnish thus sapped of its life. The natural pigments, such as umber, sienna, ochre, etc., offer the least chemical antagonism to varnish when properly prepared and incorporated with suitable vehicles to form a paint.

Why do varnishes lose their brilliant gloss and crack? The uninitiated might be led to suppose that cracking was the inevitable result when varnish loses its lustre, but such is not the case in every instance, as the loss of lustre and cracking of varnish is sometimes due to quite different causes. The causes of both are due to two general causes, and it is the unnatural rather than the natural cause that concerns us most. When varnish has served well its day and generation we are not surprised to see it announce its demise by cracks, blisters or in any manner peculiar to its composition. It is the premature deadening and cracking that causes surprise, when we consider that all the true and tried means known to the practical painter have been carefully observed in preparing for it a foundation, and also in its application. Science has proven that all substances, both organic and inorganic, that enter into the complexity of industrial life have limitations that are either fixed or regulated by natural laws, and it is the solution of the operation of this principle so far as it applies to paint and varnish, rather than the superficial indications that engage the attention of the up-to-date painter of inquiring mind. As far as this principle applies to the cracking of varnish its solution depends upon the varnish maker, upon the one hand, and upon the other on the painter whose duty it is to apply it. But when such laws have been violated either ignorantly or carelessly by either party we may not be surprised when the cracking occurs. Therefore, a varnish of the highest grade, if it has not been produced strictly in accordance with scientific laws, may crack prematurely even when applied under favorable conditions, and thus cause the innocent painter to chide himself for his apparent ignorance or neglect in contributing to such deplorable results. On the other hand, the reputation of the finest varnishes is sometimes made to suffer at the hands of either the incompetent painter or for lack of favorable conditions in its application.

The physical structure of a surface built up of paint and varnish on which to apply varnish is in principle not materially different from that of a building or other structure, in that a good foundation is the basis of both, and while a defective foundation of a porous and absorbent nature may, and does often, cause the premature deadening of varnish, it is not necessarily the cause of varnish cracking, but it is more common to both than any other single cause.

Of all the causes that cause the deadening of varnish, a porous and absorbent surface is perhaps the most common of all known causes, and in order to prevent this, there must be a nearer approach to elasticity in the under or surfacing coats. Sufficient elastic fluids should be incorporated with the surfacing mixture to prevent the absorption of the succeeding coats of varnish and paint, and the coats should be applied thinner than formerly.

The surface thus formed should be flat but not dead. Attention to this particular cause, and also to the other causes mentioned, will decrease the deadening of varnish to the minimum degree. Of all the causes mentioned that cause varnish to crack, that of flowing coats, overloaded surface, hurried work and lack of proper drying and heating facilities are the most common. Although the overloaded surface is a certain cause of cracking, it does not usually make its appearance for several years after a car enters service, and has been repeatedly varnished.

After repeated applications of varnish, and when it has reached a certain degree of thickness, it cracks for the reason that under alternate degrees of heat and cold the outer layer is first affected, and begins to expand or contract, while the lower layer is yet stationary. This is what may be termed unequal expansion, and cracking is an inevitable result.

This theory can be demonstrated by subjecting a piece of thick and a piece of thin glass to a very high temperature; the inevitable result of which will be the cracking first of the glass of greater thickness. Therefore, it is plain that the obvious remedy for this cause of varnish cracking is to defer as long as possible the overloaded surface. How can this be done? By a more thorough painting in the first instance. By a more thorough system of terminal cleaning, in order to insure the better preservation of the varnish, thus extending to the greatest possible limit the interval between the necessary revarnishing periods and when it becomes really necessary to revarnish, by applying only sufficient varnish to afford the necessary protection during the interval before the next shopping period.

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*Abstract of paper presented before the meeting of the Master Car and Locomotive Painters' Association of the United States and Canada, Washington, D. C., September 11, 1906.

PRACTICAL CAR SERVICE.

The regular monthly meeting of the New England Street Railway Club was held at the American House, Boston, on the evening of November 22. The subject of the evening was a paper by Mr. Timothy Connell, supervisor of timetables, Boston Elevated Railway, on the topic of "Practical Street Car Service."

Mr. Connell began by pointing out the importance of a thorough study of the car service on large systems, as problems regarding it are continually arising, and a large part of the expenses and practically all the revenue of a street railway company are derived from the operation of its cars. Street car service on a large system, in order to be practicable, must first of all be agreeable and suited to the traveling public, and yet be directed with the utmost economy and regard for the commercial interests of the operating company. It is surprising how much expense can be avoided by careful attention to the various headways of cars; by running only when and where car service is necessary, and yet without being so sparing in the schedule as to cause criticism from the public. In order to provide a proper service for all, the traveling habits of the residents of the various districts, and also the hours during which they make the greatest use of the cars must be considered.

In the part of the country served by Mr. Connell's system the following are generally found to be the hours during which persons of different occupations travel: From 4 to 6 a. m. the traffic, which as a rule is light, is largely composed of those whose duties require them to be at their places of business at an early hour, as employes of markets and restaurants, porters, janitors, etc. From 6 to 7 a. m. the number of passengers is greatly increased, and is composed of the laboring and mechanical people. From 7:30 to 8:30 a. m. the traffic, which has now reached its maximum, consists of store and office employes; from 8:30 to 9:30 a. m., of merchants and professional men, with a gradual decrease in the volume of traffic. The traffic from 9:30 a. m. to 3:30 p. m. is made up principally of shoppers, tourists and others, who furnish a normal and profitable patronage. Up to this hour the traffic, as a rule, is centered chiefly toward the business district, but from 3:30 to 6:30 p. m. the tide of metropolitan travel flows again to the suburbs.

Here one of the difficult problems of transportation presents itself. It is required to return to the suburbs in the space of three hours the multitude which for eleven hours has been accumulating in the business center. Great care has to be taken to supply sufficient car accommodation to meet the requirements of this outward bound multitude. After this volume of passengers has been accommodated, there is a lull until the theater and concert traffic, say from 7 to 7:45 p. m., and then another lull until the return homeward from 10 to 11:30 p. m. Through the night cars are operated for the accommodation of patrons whose duties compel them to travel to and from the city, and for those returning from social affairs. These cars should cover all the suburban districts of importance, and should be centralized as much as possible in the city from which they radiate.

This night service, while not directly profitable from a monetary point of view, is a great accommodation to those by whom it is patronized, and is one of the great necessities of modern life. In the end, however, a large indirect revenue is derived by a company which is generous in its night cars, for, although these cars do not of themselves yield any direct profit, people are inclined to settle in those districts where cars are available at all hours, even though they may have no occasion to use the night cars, and the increase in population thus attracted helps materially in upbuilding the day traffic, amply repaying the company for the night cars.

On Saturday afternoon a great many people return home at 1 o'clock instead of between 5 and 6, as on other days, and, of course, other changes must be made to meet any abnormal conditions of travel which may arise. On Sundays and holidays the periods of travel change considerably, requiring an entirely different schedule to meet the travel, of which the direction and time are not at all like that on the ordinary weekday. The business sections are practically deserted, and the tide of traffic is directed toward the residential districts, or, in the summer, to the country and seashore resorts. On these days even more attention is required than on week days; since the traffic is much heavier at times. It is compressed into fewer hours, chiefly from 1 to 10 p. m., but, of course, varies with the weather conditions.

During the hours of normal traffic on the Boston Elevated system, from 10 a. m. to 3 p. m., there are constantly in use 716 surface cars and 96 elevated cars, comprising 24 trains of 4 cars each. This number is increased during the rush hours between 5 and 6 p. m. to 1,375 surface and 150 elevated cars, comprising 30 five-car trains, and during this hour these cars carry on an average 70,000 to 75,000 persons.

Mr. Connell then cited a few examples of traffic congestion at certain points, to show the difficulties met in operating the surface cars. On Boylston street between Arlington and Berkeley streets, in the short space of 1-7 mile, during the rush hour mentioned, 239 cars pass each way or 478 cars all told. These cars have an average headway of only 15 seconds, which at the rate of speed laid out for that point gives an average spacing of about 150 feet. It is therefore of immense importance that those having in charge the movement of these cars avoid so far as is possible anything which would cause the silghtest congestion, for even a slight delay to one car would immediately be communicated to several cars following, to the annoyance of the traveling public. On Washington street between Adams Square and Hanover street, ⅛ mile, 311 cars pass during the rush hour; at Washington and Summer streets 300 cars pass in the several directions leading from that point in the rush hour; at Dewey Square 250, at Dudley street transfer station 225, and at Sullivan Square 235 cars all pass between 5 and 6 p. m.

It is an absolute necessity for one who maps out a car schedule, in order to obtain success, to be perfectly familiar with all the territory covered. Constant, close personal observation of the conditions is essential at all hours of the day. Conductors' records are to a certain degree valuable helps in ascertaining the amount of traffic, but these are at best but secondary helps, because at the present time on account of the many transfer points on most of the routes run in large cities, at which there is apt to be a continual shifting of passengers, the conductors' records are apt to be deceptive. A conductor may at the end of his trip have a record of 125 passengers, and yet at no one time have had more than 40 or 50 persons on the car on account of the constant changing at transfer points. To gain the true information regarding the traffic it is not necessary that one travel over an entire route. It is possible to gain a clear knowledge of the service required on several routes at one time, by personal observation at the point of vantage. Such observations will keep one in touch with all parts of a system, and furnish the information needed to make the service at the same time agreeable to the public, and yet work to the commercial advantage of the operating company by enabling one to judge of the proper number of cars to run and the proper times and intervals. It is not enough for one in arranging a car service to confine his attention merely to one district. He must also consider the proper spacing, where cars combine with other lines at junctions, since to neglect this will lead to an erratic headway and an unevenly distributed car service. To avoid this the schedule must be prepared with the utmost care and deliberation, so that the cars from different points may enter upon a trunk line at proper intervals.

Although an apparently perfect schedule may be prepared, arranged with a view to give the utmost satisfaction to the public and at the same time to prove of the greatest commercial success to the company, still this same schedule when put in operation may be so poorly run as to suit neither the public nor the company. The causes may be any one of the following: Low voltage. The slow or indifferent motorman who does not foresee the conditions which he is to meet, nor familiarize himself with the traffic which he is liable to encounter at the hours of abnormal travel. He has more headway than belongs to him, so that his car is overcrowded through his failure to keep up, and he is continually arriving late. The conductor who allows his platform to be crowded without any effort on his part to urge passengers to move forward in the car, so that the movement of passengers on and off is impeded, and running time used up. The tardiness of a car, however, is not always due to the fault of its crew, but is sometimes to be ascribed to the fact that the motorman who is running the preceding car overspeeds the car through the populous parts of the route, thereby leaving an excessive headway to the following car, which is in consequence overcrowded. The erratic headway from this cause alone should prompt the instructors of new men to instil into both motormen and conductors the value and importance of adhering as closely as possible to the schedule. Careful observation by inspectors would count for much at junction points and points of heaviest riding, to see that the motormen do not run their cars ahead of time, leaving heavy freights to the following cars, and, on the other hand, that the slow men keep up to the schedule. Starters, too, should be prompt even to the quarter of a minute in starting cars, and should study the habits of each crew to determine whether they are fast or slow. Alertness and promptness in starting on signal would result in a smoother car service and fewer complaints from the public.

Another main cause of disarrangement in the operation of the schedule is the obstruction from vehicles occupying the car tracks, which, although perhaps unavoidable in some cases, could on the whole be greatly remedied. Then there are other causes which are totally unavoidable, such as adverse weather conditions, the hindrance caused by drawbridges and grade crossings, etc. Disarrangement of the car service from any one or a combination of these causes tends to bring down condemnation and blame, not to say great annoyance, upon the management of a company, from dissatisfied patrons who claim they are not being given sufficient transportation accommodation. To satisfy these patrons more cars must at times be run than are necessary, at an additional expense which must be met without any more revenue than would be received from the fewer number of cars required to do the work, if the schedule were properly adhered to. In regard to vehicular obstructions, police officers on duty should be compelled to pay some attention to these causes of delay and see that drivers do not thus infringe on the rights of the great traveling public.

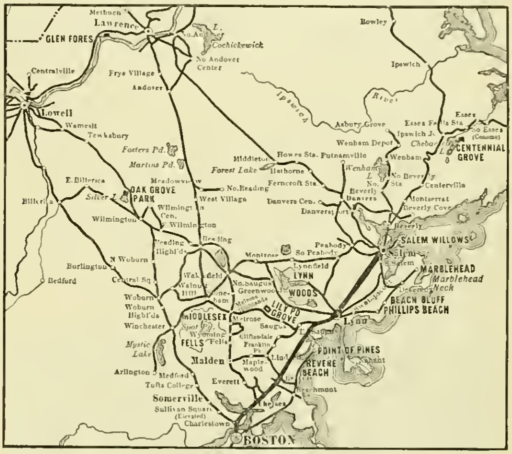
One of the greatest detriments to that rapid transit which is the chief desire of the traveling public today is the prevalent frequency of stopping places, especially on lines where headways are very close, in such cases retarding the movement of cars to such an extent as to more than offset in time lost the supposed advantages gained by the nearness of stops. Hence, in establishing stopping places it would be well to consider what effect they will have upon the running time schedules, when weighed with the supposed increase in the number of patrons. On lines where the headway is very frequent, much less service would be required if the cars were properly operated as to time and regularity of intervals, as this would secure a proper and even distribution of passengers, instead of the first car being crowded and the cars following being practically empty.

There was no discussion of the paper, but in answer to a question Mr. Connell stated that on the Boston Elevated system the street traffic is closely watched by uniformed inspectors, who report the need of new cars, by telephone, to the division superintendents; the latter officials then instruct the starters at the car houses to order out extra cars. These telephones are located at many important points on the system and are in general private instruments used solely for company business.

THE BOSTON-SALEM INTERURBAN LINE.

The Boston & Northern Street Railway Company completed at the beginning of the past summer a new trolley short line between Salem and Boston, the terminals being at Town House square, in the former city, and at Scollay square subway station, in the latter. Although this line is a regular part of the Boston & Northern system, it is of interest on account of its direct connection of the two cities named above, the substantial character of its roadbed and the improved type of its rolling stock. The running time is 1 hour and 15 minutes, which is a decrease of 28 minutes from the old schedule. The distance of the new route is 14½ miles.

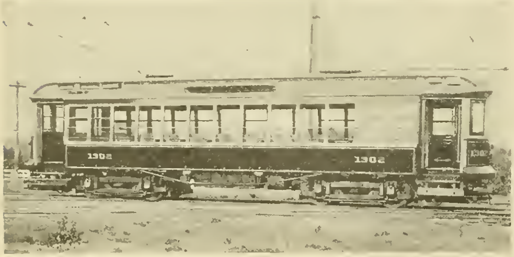
The route is double-tracked throughout its entire length. From Scollay square, Boston, the regular Lynn route is followed through Chelsea and Revere to Market square, Lynn, where, instead of branching off to Central square, it continues along Western avenue to Floating Bridge, where it passes partly over private right of way and partly by highway to the intersection of Boston and Essex streets, Salem, and thence by the regular tracks in Salem to Town House square. From Floating Bridge to Salem the line is entirely new, and it passes through an attractive rural district which is thus far but thinly settled.



Boston-Salem Interurban Line—Map of Route and Connections.

This part of the route is built with 75-pound T-rails and stone ballast. The street had to be widened throughout its entire distance, and ledges from 15 to 18 feet deep had to be removed, sometimes for a distance of 300 or 400 feet. The work was started in December, 1905, and was finished near the end of May, 1906. The preparation of the roadbed for the 13,000 feet between the Lynn and Salem line to Essex and Boston streets, in Salem, was one of the most difficult pieces of electric railway construction thus far accomplished in New England. Five gangs of about 100 men, about 15 steam drills and a considerable quantity of dynamite were required for the work. It was necessary to build many culverts and a large number of fills were also required, some of them being 20 feet deep. At a point near the so-called Sands farm was a fill of 50 feet, into which over 4,000 cubic yards of rock from a ledge farther on were dumped to bring the roadbed up to grade. Beside and parallel with Floating Bridge it was necessary to build a pile bridge 600 feet long, some of the piles being 60 feet long.

The overhead construction is standard single trolley No. 00 size, with span suspension, over each track. The trolley poles are of hard pine, 35 feet long on the average, and spaced 100 feet apart. Power is supplied to the cars by the Boston elevated station while they are operating on the tracks of that company, between Vine street, Charleston and Scollay square, and by the Chelsea, Lynn and Salem power plants of the Boston & Northern company.



Boston-Salem Interurban Line—Standard Car.

The schedule is operated on 30-minutes headway in each direction. The first car in the morning for Boston leaves Salem at 5:37 a. m., and the last Boston car at night leaves Salem at 10:07 p. m. At Scollay square, Boston, service towards Salem begins at 6:52 a. m. and ends at 11:22 p. m. The fare between Salem and Boston is 20 cents, against 35 cents by the Boston & Maine steam line. The commutation rate on the latter for a 50-ride ticket is 22 cents each way. The 20-cent electric fare from Boston allows free transfer at Town House square to any point in Salem, and by buying an 8-cent check in paying the last fare approaching Boston, a passenger is allowed to go to any point upon the Boston elevated system. The reverse is of course true also. The fares from Scollay square on any point between it and the Chelsea-Revere line are proportioned as to distance.

Open cars were used on the line during the summer, but recently eight new semi-convertible cars were purchased for this service. These are now in operation, five being required to maintain the schedule. One car was built by the St. Louis Car Company, the other seven being supplied by the J. G. Brill Company, of Philadelphia. Except in minor particulars the designs are similar. The St. Louis car is equipped with swivelling cross seats, having radially operated backs, so that if it is desired the car can be converted into a longitudially seated vehicle.

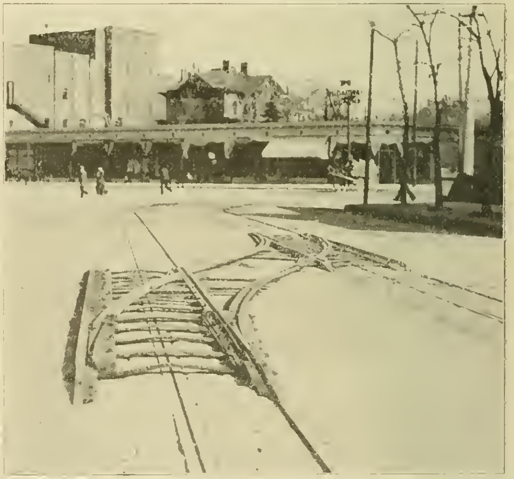
Each car is 45 feet 10 inches long over all, with a 33 foot 11 inch body, and an extreme width of 8 feet 5 inches. The seating capacity is 52 passengers, and there are two rows of 9 rattan cross seats each, with four longitudinal seats at the end of each car. The cars are of the so-called "easy-access" type, with wide vestibule, four pneumatic doors and folding steps, which make it impossible for a passenger to enter or leave a car while it is in motion. The cross seats are 31 inches by 17 inches, spaced 31 inches apart on centers, and the longitudinal seats are each 17 inches by 60 inches. The aisles are 27 inches wide, and the St. Louis car is fitted with hand rails on the tops of the seats, end handles being used on the Brill seats. The motorman has a compartment at each end which closes him in by folding doors, leaving a vestibule 26 inches long, which can be occupied by passengers for the entire width of the car. The aisle between the longitudinal end seats is 46 inches wide.

The door openings are 38 inches wide each, and the sliding part of each door is equipped with a pneumatic buffer to prevent injury to passengers in case they become caught in any way. Each door has its separate air valve for operation by the motorman, four valves being supplied to each vestibule. On each side of the car body are 13 windows, 9 of which slide up or down. The roof is of the monitor pattern, with wired-glass windows. Each car is 15 feet high from the rail to the base of the trolley stand. The windows are fitted with Pantasote curtains. The interior finish is a birdseye maple head lining and a cherry framing. Straps are provided only over the longitudinal seats. The Brill cars are equipped with mechanical sanders operated by hand, the St. Louis car having a pneumatic sander. Two International registers are used on each car. The cars are lighted inside by three rows of five 16-candlepower incandescents each, two incandescents being used in each vestibule. There are also four illuminated signs per car, and push-button call bells are installed.

The motor equipment of each car consists of four General Electric No. 90 motors, mounted on Brill No. 27E-1½ trucks, with a gear ratio of 16 to 70. Type M control is used, so that the cars can be operated in trains if desirable. The wheels are steel-tired, 34 inches in diameter, with 2¼-inch tread, and the journals are 4 by 7 inches. General Electric air brakes operating at 95 pounds air pressure are used, with emergency hand brake wheels in the cab. Arc headlights and Wilson trolley catchers complete the equipment. Each car has two trolleys, fenders and scrapers. Completely equipped the cars weigh about 30 tons each, and they are painted on the outside with standard Merrimac green, with silver and yellow stripling.

A TEMPORARY CROSSOVER WITH SWITCHES.

An interesting product of the Denver City Tramway Company's shops is the temporary crossover shown in the accompanying illustration. This crossover may readily be loaded on an emergency wagon and installed in the street at the time of fire or other extraordinary condition requiring the rerouting of traffic. It will be noted that each end of the crossover is provided with a tongue switch and mate, so that the greatest flexibility of operation may be obtained.



Denver City Tramway—View of Temporary Crossover and Switch.

THE CITY RAILWAY COMPANY'S NEW BUILDINGS.

The erection of a new car storage barn near its general office building has made it possible for The City Railway Company, Dayton, O., to abandon three barns in different parts of the city and centralize its entire car maintenance work. The first and second units of the buildings, consisting of the main storage barn and the office building, were completed two years ago and the third unit, which is to be used entirely for the storage of car bodies and cars during the off-season, was recently built. These buildings, in addition to the machine, paint and carpenter shops, which were already built, give the company very complete accommodations.

New Buildings, The City Railway, Dayton—General View of Shop, Office and Storage Buildings.

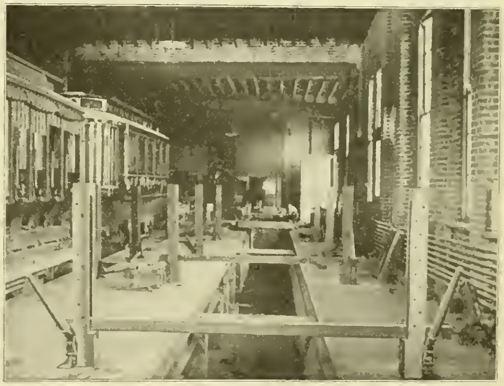
Although there are two other street railway companies operating in the city of Dayton, namely, the People's Railway Company and the Oakwood Street Railway Company, The City Railway Company maintains 30 miles of track and operates 50 regular cars. The officers of the company are: D. B. Corwin, president; G. B. Clegg, vice-president; Valentine Winter, secretary; T. E. Howell, general superintendent, and C. E. Bitzer, assistant superintendent. The board of directors is composed of the president, vice-president and secretary, and E. C. Grimes, Eugene Barney, Patrick Roach and J. D. Ellison.

New Buildings, The City Railway, Dayton—Exterior of Office Building.

Shops.

The company owns about six acres of land at the corner of Western and Auburn avenues, which is almost wholly occupied by its buildings. The machine shop occupies a building formerly used as a power house for the Dayton & Soldiers' Home Railway Company. The building is 60 by 185 feet in floor area. It is divided into four main parts, the truck room occupying the front of the building. Back of this are the machine shop, the armature and store rooms and the blacksmith shop. In this building are also located the boilers, which furnish steam for heating all of the buildings.

An interesting feature of the equipment is the set of hoists used for raising and lowering car bodies. There are four of these sets, each consisting of four track jacks fitted with 4-foot stems. The stems of each pair of these jacks serve to raise the ends of crossbars spanning the pits and arranged, as shown in one of the illustrations, at such distances apart as will enable them to serve the different length cars. The 4-foot posts in front of the jacks serve as guides for the bars which are placed across the pit under the car bodies. The jacks are operated by hand levers. A car can be blocked up at any desired height by pins passing through the guide posts. While this device is not artistic in design, it is inexpensive and easy to operate.

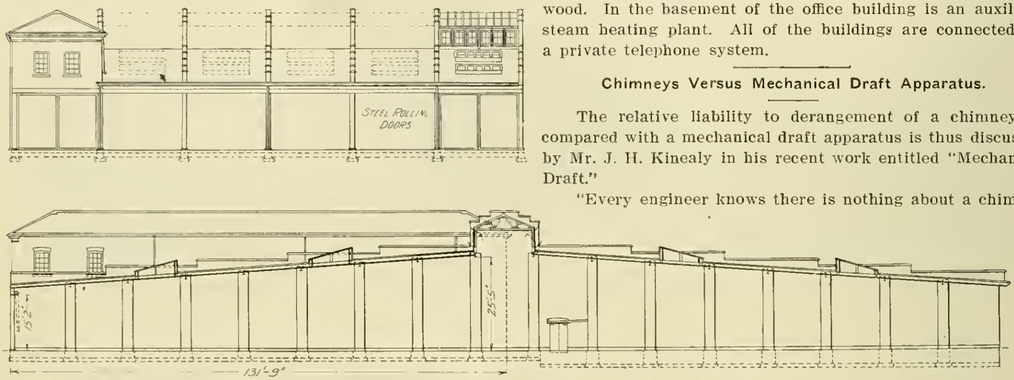


New Buildings, The City Railway, Dayton—Interior Repair Shop Showing Car Body Hoists.

The paint and carpenter shops occupy a building 80 by 100 feet in floor area. In the paint and carpenter shop is suitable equipment for all general woodwork and painting required in car repairs. Four tracks lead into this building from the south.

The main car barn is 272 by 185 feet in size. It is divided longitudinally into seven stalls 21 feet wide and one stall 23 feet wide, by brick partitions, which extend 18 inches above the roof, making each stall fireproof and independent of its neighbors. The roof is of asphalt composition. Special attention was given in the arrangement of skylights in the building. Five dormer windows, two on each slope of the roof and one at the peak, are provided in each stall. The roofs of the dormers consist of wired glass ¼-inch thick in a stationary galvanized iron frame. The side sashes are hung on pivots.

Both incandescent and arc lamps are provided in each stall. The incandescent lamps are mounted in niches in the pit walls. Provision is made by means of a circuit breaker, for cutting out all circuits in the building during a heavy storm or at times when the barn is not in use.

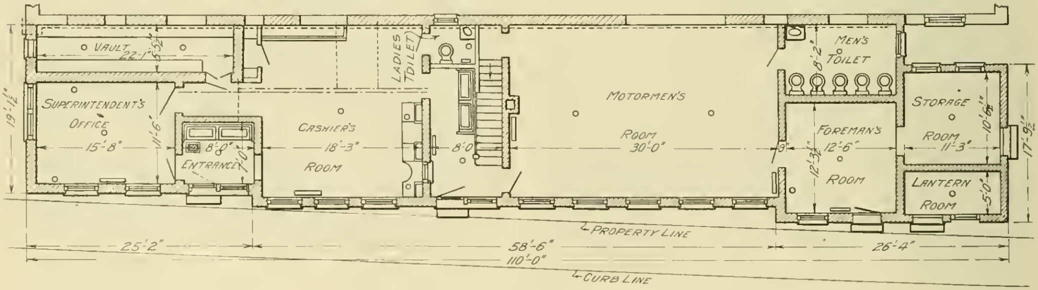


New Buildings, The City Railway, Dayton—End View and Longitudinal Section of New Car House.

Two tracks enter each stall. Under the first three sets of tracks at the east side of the building are 1,340 lineal feet of inspection pits. These pits are of standard concrete construction capped by oak sills 5 by 7 inches in section. One stall is used for a car wash-room. The floors of the entire barn are laid with stone blocks and brick, excepting the wash-room, where cement is used.

New Storage Barn.

The new storage barn, which has just been completed, has a floor area 264 by 135 feet and is one story high. This building, like the main barn, is divided by brick walls into stalls 20 feet wide. The two tracks in each stall extend for the length of the building. This barn will be used exclusively as storage for cars not in regular service, and for the summer car bodies during the winter months and the winter bodies during the summer months.



New Buildings, The City Railway, Dayton—Plan of First Floor Office Building.

The office building occupies a floor area 110 by 19 feet. It is two stories high with a basement. The ground floor is divided into a superintendent's office, 11½ by 15¾ feet, a cashier's office, 18 by 19 feet, an employe's room 30 by 19 feet, a foreman's room 12½ by 12½ feet, a storeroom 11 by 10½ feet and a lantern room 11 by 5 feet. In addition to these there are a brick fireproof vault 22 by 5½ feet, two toilet rooms and a hallway with stairs leading to the second floor.

On the second floor are located the president's and secretary's offices and an assembly room, which will later be used as a meeting place for the Employes' Benefit Association. The walls of the office rooms are calcimined a darkgreen tint. The woodwork is oak and the floors are of hardwood. In the basement of the office building is an auxiliary steam heating plant. All of the buildings are connected by a private telephone system.

Chimneys Versus Mechanical Draft Apparatus.

The relative liability to derangement of a chimney as compared with a mechanical draft apparatus is thus discussed by Mr. J. H. Kinealy in his recent work entitled "Mechanical Draft."

"Every engineer knows there is nothing about a chimney to get out of order, no machinery of any kind and no moving parts, and the only way a chimney can be put out of service is for it to fall. Thin-guyed, sheet-steel chimneys rust out quite rapidly and then are easily blown over; self-supporting steel chimneys, either lined or unlined, usually have a much longer life, the length of which depends naturally upon the thickness of the metal of which they are made and the care given to them; brick or stone chimneys when well built last practically forever, and when properly designed and erected do not fall unless struck by lightning or a cyclone. A mechanical draft apparatus, however, always comprises in addition to the fan or blower a motor of some kind for driving the fan or blower; so that there are moving parts, any one of which is liable to give trouble. In fact, a mechanical draft apparatus is a machine, liable to all the accidents and ills of a simple machine; and because of this fact it is necessary, when the draft depends entirely upon the mechanical draft apparatus and there is no chimney to fall back upon in case of an accident to the fan or its motor, to instal duplicate fans and motors. When, however, there are duplicate fans and motors of the proper size, there is no more danger of a mechanical draft apparatus being put entirely out of service, or becoming so deranged as to cause a shut-down of the entire power plant than there is in the case of a chimney of brick or stone."

NOVEMBER MEETING CENTRAL ELECTRIC RAILWAY ASSOCIATION.

The last regular meeting of the Central Electric Railway Association for the year 1906 was held at the Algonquin Hotel, Dayton, O., on November 22, with a good attendance. The meeting was called to order by President E. C. Spring at 11 a. m. in the sun parlor of the hotel. Mr. Spring said that the executive committee had considered abandoning this meeting because the Columbus convention was held so recently, but that it had been decided, in view of the fact that the association assembles only once in two months, that none of the meetings should be missed. He said that since the last meeting of the association Secretary John H. Merrill had resigned to become engaged in the operating side of electric railway work, and that Mr. W. F. Millholland, of the Indianapolis Traction & Terminal Company, had been appointed secretary until the January meeting. He complimented the association on its favorable recognition by the American Street and Interurban Railway Association at Columbus, mentioning the election of Mr. A. W. Brady, of the Indiana Union Traction Company, as one of the vice-presidents of the national association. He also read a letter from Secretary B. V. Swenson, of the American association, thanking the Central association for its work at Columbus.

It was announced that the annual meeting would be held at the Claypool Hotel, Indianapolis, on January 24, and that it was hoped to have present as guests a number of prominent traction men from all over the country. As the annual election will be held at the Indianapolis meeting the president appointed the following nominating committee: J. O. Wilson, of the Cleveland & Southwestern Traction Company; F. D. Norveil, the Schoepf-McGowan lines in Indiana, G. H. Kelsey, of the Indiana Union Traction Company; C. M. Paxton, of the Dayton & Troy Electric Railway, and S. D. Hutchins, of the Westinghouse Traction Brake Company. It was explained that according to the by-laws the president and second vice-president will be chosen for next year from Indiana, while the first vice-president and treasurer will be from Ohio.

Secretary Millholland read the financial report showing that the affairs of the association were in good condition, with all debts paid and a small balance on hand.

Automatic Couplers.

Mr. W. T. Van Dorn, of the Van Dorn Company, in opening the discussion on "Automatic Couplers," said that a very strong draft rigging, with little play between the coupler heads, was essential to multiple-unit operation, and that automatic couplers allowed a very close coupling, as close as 1-16 of an inch if the device was properly adjusted. He said that uniformity in design of couplers was practically impossible at present because of the variation in height of cars and in length of draft rigging.

Mr. C. B. Fairchild, Jr., of the "Electric Traction Weekly" said that the tendency toward interchange and heavier cars demanded more uniformity and heavier designs of couplers and suggested that the standardization committee take up this subject.

Mr. Van Dorn was of the opinion that it was possible to work out a set of standard dimensions, as the steam roads had adopted a standard draft rigging, and said that such a set of standards would be of great benefit to the manufacturer as he could keep the couplers in stock instead of making them up according to specifications. He suggested 4 feet 6 inches from center of swivel to front face, as a good length of drawbar.

Mr. W. H. Evans, of the Indianapolis Traction & Terminal Company, chairman of the standardization committee, said that the length of the coupler was immaterial from an operating standpoint, but that the critical dimension was the height from rail to center of drawbar. Considerable difficulty had been experienced in coupling city cars with interurban cars because of the variation in the heights of the drawbars, and in Indianapolis it had been necessary to use a hinged drawbar. A standard height should be adopted in order to couple with the foreign cars.

Mr. Burton R. Stare, of the Wallace Supply Company, said that automatic couplers were still in their infancy and that their greatest advantage lies in through service where quick coupling saves much time at junction points. He thought a good plan would be to appoint a committee to formulate a standard height of cars and to consider the merits of various couplers.

Mr. Evans said it was the intention of the standardization committee to take up the subject this year.

Mr. S. D. Hutchins, of the Westinghouse Traction Brake Company, thought the committee should look into the size of wheels, which to some extent determines the height of cars, and that a standard height of drawbar should be adopted.

Mr. Spring explained that the standardization committee was co-operating with the committee of the American association in the matter of standards.

Mr. F. D. Carpenter, of the Western Ohio, said that the position of trucks must be investigated. Some measure 11 feet from the center of the bolster to the end of the bumper, while others are only 7 feet. There were many curves as high as 45 degrees in towns, and couplers must be designed to meet this requirement. Only a short time remained before the Ohio railroad commission will demand that interurban railroads adopt a standard coupler, and he thought the height of cars should be standardized, so that the roads will be in a position to comply.

Mr. E. F. Wickwire and Mr. Charles H. Tomlinson, of the Ohio Brass Company, then demonstrated a model of the Tomlinson automatic coupler, which has been in service about two years. Mr. Tomlinson said that automatic couplers reduced the liability of injury to employes by removing the necessity of going between the cars. He stated that the coupler was designed to couple on any ordinary curve, that there were no loose parts to the device, and that in case of a car barn fire, if the couplers were left in alignment at night one man could save a train of cars by simply backing up, thus coupling the cars, and then pulling out. He showed a drawing of a coupler which had been arranged to accommodate a sudden change in grade where one car was on a level and the other on a 10 per cent grade, which necessitated a vertical movement of the drawbar of nearly 16 inches.

A recess was then taken until 2:15 p. m. for lunch. During the recess the members of the executive committee held a meeting and were given a luncheon by President Spring.

The afternoon session was opened by Mr. O. P. Gothlin, of the Ohio railroad commission, which has recently assumed jurisdiction over the electric roads.

Mr. Gothlin assured the members that the commission desired to co-operate with the railroad men in every way, and that he was pleased to have this opportunity to meet the men and exchange ideas unofficially. He said that the executive officers of the association would in a few days receive an invitation to a conference at Columbus to determine what should be done for the good of the service and in order that the commissioners might learn the peculiar operating conditions existing on the electric roads.

As several members wished to know the law in regard to automatic couplers, Mr. Gothlin then read that section from House Bill 242, which makes it unlawful for a common carrier to use cars or locomotives not equipped with couplers which do not require employes to go between cars to operate them. He said that the commission desired to do everything in its power to insure the safety of employes, and that it would encourage as much as possible the use of safety appliances on steam and interurban railroads, but he thought such a restriction might not be insisted upon where cars are operated singly. He was told that only a few roads in Ohio are operating cars in trains, but it was the opinion that the practice would grow rapidly. Mr. F. D. Carpenter said that it would be a hardship to require automatic couplers until the equipment had been standardized. He understood that there were inspectors watching the steam roads for violations of the law, and asked how much time would be allowed the interurbans before the penalty would be in effect. Mr. Gothlin replied that the commission did not expect the impossible, nor would it insist on a needless expenditure of money; that the situation with the steam roads was different, as they had had 15 years' notice, while the interurban roads had not had time to comply with all the requirements of the law. He was inclined to think the commission would be lenient. He explained that the commission can only instruct the attorney general to bring suit. It cannot assess the penalty itself, and the attorney general would probably not bring suit unless requested to do so by the commission. Automatic couplers and standard specifications were on the program for the conference with the officials.

Mr. F. J. J. Sloat, of the Cincinnati Northern Traction Company, inquired as to the attitude of the commission in the matter of height of crossings under highways and steam roads, and asked whether there was a prescribed height.

Mr. Gothlin replied that a minimum height of 18 feet was prescribed by law in Ohio where an electric road crossed under grade.

Mr. Sloat also inquired whether the commission had the power to regulate the width of cars and the width of the devil strip. He said that several cities on his lines restricted the width of the devil strip to 4 feet, which was too narrow for interurban cars, and wished to know if condemnation proceedings could be brought to secure sufficient clearance on city streets.

Mr. Gothlin said that this matter had not yet been taken up, but that it ought to be decided. The situation was complicated, he said, by the power of the municipalities. He was of the opinion that where interurbans entered over the tracks of city companies they would have to abide by the regulations of the city.

Free Transportation.

In opening the discussion on "The Discontinuing of Free Transportation, and to What Limit Shall Same Be Issued," Mr. Gothlin read section 8 of House Bill 78, known as the "Wertz law," passed at the last session of the Ohio legislature, which provides that the act shall not be construed to prevent the giving of free transportation or reduced rates to ministers of the gospel, officers of charitable institutions, objects of charity, railroad officers, agents or attorneys in the performance of their duties, and their families, nor to prevent the interchange of free transportation with other roads. He thought the law was very clear and that the commission would hold it a violation of the law to give passes to any others than those excepted. He believed that this prohibited the exchange of passes for advertising, as the practice opened the way to great abuses. This law, of course, only applied to transportation wholly within Ohio. In reply to a question Mr. Gothlin said that it had not yet been decided whether the jurisdiction of the commission or of the law extended over city lines, but in the opinion of the commission it applied only to roads operating outside of the city limits.

President Spring then read a letter from the traffic manager of a large system, who stated that his company was opposed to free transportation and believed in the policy of paying cash for whatever it bought and demanding cash in return. The writer said that any action taken by the association toward eliminating free transportation would meet with his approval.

Mr. F. J. J. Sloat, of the Cincinnati Northern Traction Company, said that the subject of free transportation was a delicate one. He believed that it was necessary for each company to take care of the question from its individual standpoint, as it was difficult to make a rule which would apply in all cases. Public sentiment had changed of late, and it was the opinion of many that the electric roads will have to fall in line with the steam roads and eliminate passes, as the Ohio legislature had passed certain laws governing this question. The practice of giving passes caused much annoyance, and in some cases imposed a serious drain on the companies, amounting to thousands of dollars. The matter of transportation to newspapers was especially difficult to handle. His road covered this question by a contract with the newspapers to furnish a certain specified amount of transportation in return for a definite amount of advertising at regular rates. This transportation was given in the form of books, no trip passes being issued, and this arrangement had proved quite satisfactory to both sides. He thought the best way out of the problem, however, was to abolish the passes entirely.

Another manager said that he operated two properties; on one everyone paid fare, even the manager, except employes in uniform. He believed that this was the only proper plan. But on the other property, a recently acquired road, it had been the custom to give passes, and nearly every city official or person who had a little influence had a pass. He hoped to see the day when the practice would be stopped. His company was building some extensions, and on those lines there would be no free transportation. He believed that no single factor was more injurious to the operation of a road than free transportation, and that every road should be willing to pay cash for whatever it received and should demand cash in return. Employes in uniform or wearing badges are entitled to ride free. As to giving passes to their families that is open to abuse, and his company has almost eliminated it.

Mr. Carpenter thought the gentleman had the right idea. The law definitely states what we must do and he proposed to abide by the law. He said that at present his company issued to employes a 52-ride ticket, good for one year, and the arrangement had proved successful. He believed they would have trouble with the newspapers, but he didn't propose to lay himself open to a fine of from $100 to $10,000.

In reply to a question whether the law permitted the exchange of passes for advertising, in specified amounts, Mr. Gothlin said, unofficially, that he was of the opinion that it could not be done, following the ruling of the Interstate Commerce Commission that nothing but money could legally be given for transportation.

Limited Service.

The subject of "Limited Service and Does it Pay?" was next taken up and Mr. Harrie P. Clegg, of the Dayton & Troy Electric Railway, was asked to open the discussion, as he was to have read a paper on this subject at the Columbus convention.

Mr. Clegg said he had never considered the subject of limited service from the standpoint of whether it pays or not. He had no doubt that it did pay, but he had considered the matter more in the light of his duty as a common carrier, in the endeavor to give the public the best possible service. He did not think the companies had the right to hammer down the number of trains to fit the number of people who will ride, but said his policy was to put on more trains as fast as possible to invite new travel. The matter of competition entered the question, and the road that gave the most frequent service was preferred by the traveling public. He considered frequency of service one of the things most essential to the operation of a road. The accommodations should always be in advance of the traffic. A railway company is like a merchant who must keep different classes of goods on his shelves to attract customers, not simply keep what they actually require. It was poor service, poor equipment and disregard of healthful conditions on cars that has led outsiders to step in and tell the companies how to run their properties, and if the roads are operated only for the sake of dividends that sort of service might be sufficient, but the roads ought to listen to the demands of the traveling public.

Mr. H. A. Nicholl, of the Indiana Union Traction Company, said that his company tried to look after the demands of the public, but at the same time aimed to consider the stockholders. The earnings from limited service he had found to be 25 per cent in excess of those from ordinary service, which was perhaps accounted for by the ¼-cent a mile excess fare. No objection had been made to the excess fare, as the people were willing to pay for long runs, better cars and fast time. On roads paralleled by steam lines it was very necessary to run limiteds to keep the traffic. There were local conditions on every line to be taken into consideration. On a short road limited service was not necessary, but on long roads, that carry passengers for three or four hours it was necessary to hold the business.

Mr. C. N. Wilcoxon said that on the Cleveland & Southwestern limited service had been very profitable, although they had not looked at it so much from the philanthropic standpoint taken by Mr. Clegg. About a year ago, when conditions had been found suitable for a fair trial of limited service his company had put on limited trains between Cleveland and Norwalk every three hours between 7:30 a. m. and 8:30 p. m.; between Cleveland and Oberlin, 35 miles, every two hours; on the southern division, between Cleveland and Worcester, 56 miles, four limiteds a day in each direction, not at fixed intervals, but whenever they would give the best service. From May 15 to November 1, hourly limiteds were run on the half hour 13 hours a day, and hourly local trains on the even hour 19 hours a day. He said that the limiteds earn slightly in excess of the locals.

Mr. Carpenter, of the Western Ohio, said that nearly two years ago they had put on limited trains in connection with the Dayton & Troy for the benefit of their profits and been quite satisfied with the earnings. In January last they had extended the limited service from Dayton to Toledo, and the interline business had increased 59 per cent. He said that when they first began to run interurbans they only expected to carry passengers from town to town, but found that if the companies provide adequate service and equipment the people will ride. He believed that there is business that no one has yet reached because of lack of satisfactory service and equipment. He said that the people are there and will ride if the means is provided. He was quite satisfied with limited service.

Mr. Fairchild asked about the added expense of limited service. Mr. Nicholl said that it was cheaper because although the cars were expensive there were less stops. Mr. Wilcoxon said that tests on the Dayton & Troy and the Western Ohio showed that power consumption was considerably less for limiteds, and that the cost of maintenance of equipment was slightly less, due to the fewer stops. He said that the cost of operating limiteds was 2 or 3 cents per car mile less than for local cars. Mr. Spring said he knew of one road which had just instituted limited service on which the cars were earning about 4 cents per car mile more than locals.

Impressions of the Columbus Convention.

Mr. Spring then asked the members to state their impression of the Columbus convention. The magnitude of the convention and the large number of interesting features must have made some particular impression.

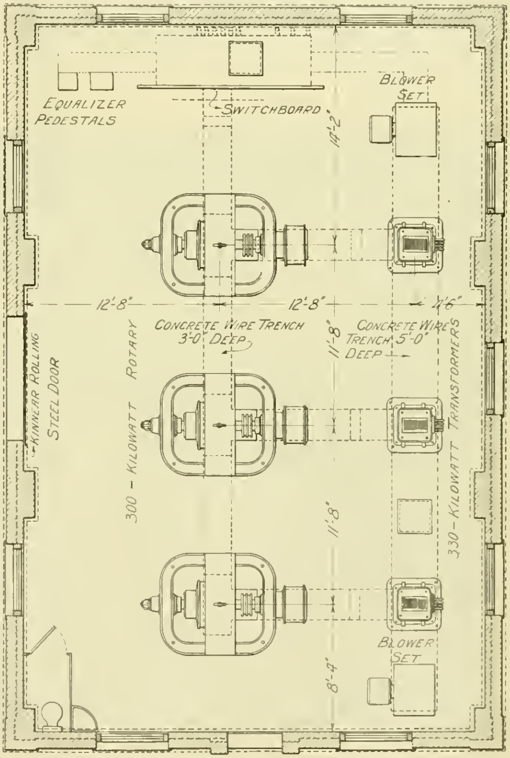
Mr. H. A. Nicholl said he had been attending conventions for many years but did not recall finer exhibits or a greater attendance than at Columbus. The meetings were better attended, the papers presented by stronger men and more interest was shown in the meetings.

Mr. Fairchild said that the unanimous opinion of manufacturers and railroad men, as far as he could learn, was that it was the most successful meeting yet held. He thought this success was due to a large extent to the fact that it was held in the central west, and to the great interest taken in it by the railroad men of this section. He said that the convention had opened up a broad field of work for the Central association and the state associations in general in taking up and threshing out the many questions that could not be fully treated by the national association for lack of time.

President Spring said that a wonderful interest had been stimulated throughout the country in the work of the central west and that the Central association had a most important mission to perform in formulating many questions to be taken up later by the national association. On his own impressions of the convention he said that the papers were more than usually interesting, especially those by Mr. C. E. Learned, on "Selection of Trainmen," and by Mr. C. A. Alderman, on "Ties, Poles and Posts."

EAST COLFAX SUBSTATION OF THE DENVER CITY TRAMWAY COMPANY.

At the present time the Denver City Tramway is making several changes in its power distribution system, which include the construction of a static transformer station at the powerhouse. This station will have a suitable equipment of 550-kw. capacity transformers for raising the voltage from that of the station busbars, 2,300 volts, to a transmission voltage of 13,200. These transformers will be installed in the brick and concrete building a few feet away from the main generating station, but close enough so that all the apparatus


Equalizer Pedestals
Switchboard
Blower Set
14'-2"
12'-8"
12'-8"
4'-6"
Concrete Wire Trench 3'-0" Deep
Concrete Wire Trench 5'-0" Deep
11'-8"
11'-8"
8'-4"
Kinnear Rolling Steel Door
300 - Kilowatt Rotary
330 - Kilowatt Transformers
Blower Set

East Colfax Substation—Denver City Tramway—Floor Plan in the static station may be remotely controlled from panels forming a part of the main power station switchboard. The transformers will be air-cooled and will stand over a basement, in which all the high-tension wiring will be placed.

East Colfax Substation, Denver City Tramway—Exterior View.

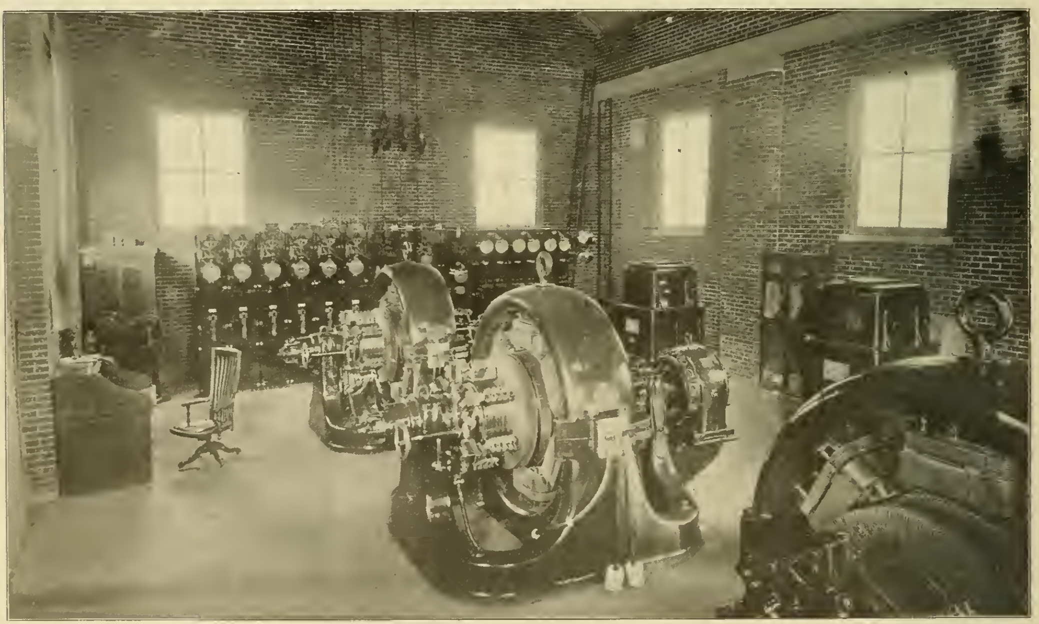
After current from the main generating station is stepped up by these transformers it will pass through motor-operated oil switches and be distributed on three overhead feeder lines to outlying substations. The lightning arrester equipment for the static station will be placed in the basement and every precaution taken to make it fireproof.

One of the feeder lines 6½ miles long serves the new East Colfax substation. This line is now operated at 2,300 volts pressure, but will, with the completion of the static station, be operated at 13,200 volts.

The East Colfax substation is located in the residence district of Denver and serves to furnish 600-volt current for trolley lines in the eastern part of the city. The building is of red brick with white stone trimmings, concrete floors, a corrugated iron roof on steel trusses and sheet iron windows and doors. The general ground dimensions of the building are 32 by 48 feet. The interior space is undivided. A 10-ton hand-operated crane of 28-foot span serves all the apparatus. On one of the long sides of the building is an opening 8 feet wide fitted with a Kinnear rolling steel door. The building is one story high with no basement. Provision, however, for all the wiring has been made by building two concrete cable boxes which extend lengthwise of the substation below the floor level. One of these trenches is 3 feet wide and 5 feet deep and extends under the blower sets and the three step-down transformers. The other trench is 1 foot 9 inches wide and 3 feet deep, and extends under the rotary converter bases, affording a convenient conduit for connecting their cables with the switchboard at the end of the building.

The electrical equipment and the auxiliaries in this station are of Westinghouse make and include the following: Three 300-kw., 600-volt, 3-phase 25-cycle rotary converters, three 330-kw., 2,300-430-volt air-cooled transformers, 12-panel switchboard with 6 machine panels and 6 feeder panels, and two motor-driven American blower fans with induction motors.

The accompanying illustration will serve to make plain the general design of this substation. It was the aim of the engineering department of the Denver City Tramway to build a station which could be relied upon for continual service, and, therefore, especial care was taken to avoid the use of any combustible materials and to arrange the apparatus so that any accident to one section would not incapacitate the others.



East Colfax Substation, Denver City Tramway—Interior View.

The car barns and shops of the Galt Preston & Hespeler Street Railway and the Preston & Berlin Railway at Preston, Ont., were totally destroyed by fire during the early morning of December 4. The loss amounts to about $75,000 including eight valuable interurban cars which were in the building

STREET RAILWAY YOUNG MEN'S CHRISTIAN ASSOCIATIONS.

BY H. O. WILLIAMS, SECRETARY, INTERNATIONAL COMMITTEE, YOUNG MEN'S CHRISTIAN ASSOCIATIONS, RICHMOND, VA.

The growth and development of the Railroad Young Men's Christian Associations throughout North America during the past five years has been very marked and significant, the figures showing that there are now in use for association purposes, 144 buildings, valued at almost $3,000,000, with a membership of 83,000 men, and the railroad corporations controlling 4/5 of the entire mileage of North America are now co-operating and contributing to the railroad associations.

The success of the Railroad Young Men's Christian Association among steam railroad men has been watched with interest by officials of electric lines which has led to the organization of electric railroad associations in four cities and it is expected that this number will be increased to many more during the coming year.

The following information regarding the street railways and the opportunities for the betterment of the employes through this agency may be of interest.

Within the past ten years the development of the electric railway industry has been phenomenal. The capital invested amounts to many millions, the executive forces operating these systems, that are now found in every city of any considerable size in our country, are among the keenest, brightest and best expert ability to be obtained. The number of employes in the construction department, shops and operating department is second only to that employed in steam railway service, amounting to nearly a million of men, and these, for the most part, are young men. Many of them come from country homes and in the line of their employment have no opportunity to attend church services, are required to work Sundays as well as week days; the exactions of their service are most severe, they are under the most stringent discipline and entrusted to them each day are thousands of people where there are hundreds in care of the employes of the steam railways.

Street Railway Young Men's Christian Associations—General Assembly Room, Virginia Passenger & Power Company, Richmond, Va.

During their work these men are brought together at the beginning or at the end of their runs, at a common center. Here they present their reports, turn in their cash and receive their instructions. As a rule, as soon as terminal barns are provided in our cities, saloons, with their demoralizing influences, abound. It is because of these conditions and the environment of the men that street railway companies have recently begun to realize that something must be done to interest and care for their employes during their hours of leisure.

Rochester was the first city to realize this, when four years ago desirable quarters, comfortably equipped, were provided for the street railway men in this city and the Y. M. C. A. given an opportunity to prove its practicability and efficiency. The work from the outset was successful and 18 months ago a second headquarters became necessary. The company's support was generous and its interest, from the start, has been hearty and practical.

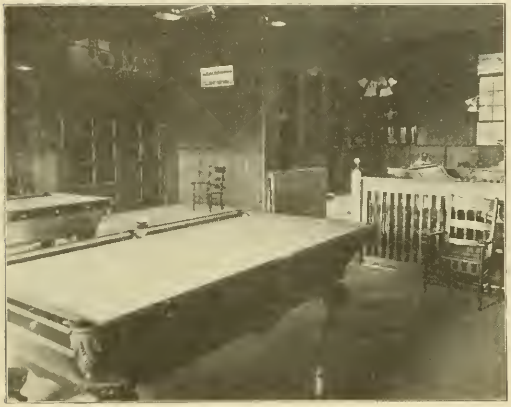
Street Railway Young Men's Christian Associations—Reading Room, East Side Branch, Rochester, N. Y.

Two years ago the second street railway association was organized for the employes of the Virginia Passenger & Power Company in Richmond, Va. The company owned a very attractive clubhouse which had been built by a recent management, but never opened, and it was the thought of the general manager to have this building thoroughly equipped with usual club features, for his men. He raised the question with Mr. Frank Gould, the vice-president, who suggested at once that a Y. M. C. A. be organized. This was done and now the association not only occupies a building at Reservoir Park in Richmond worth $15,000, but has three additional divisions well equipped and largely patronized, namely, at Main and Vine streets, at Manchester and at Petersburg. The secretary states that 30 days after opening the Petersburg branch 75 per cent of the men there had joined the association. The membership on August 1, 1906, was 740, and the attendance per day has averaged over 440. The report for July showed a cash balance on hand, with all bills paid, of $1,160.

Through the generosity of a friend a library of 1,500 volumes has been provided in this building and has been very largely used. The religious work at this point has not been altogether satisfactory, yet for the most of the year gospel meetings for men have been conducted and a bible class maintained. The testimony of the general manager, however, is that the company could not have made a better or more practical investment than the amount it expended in equipment and in contributing ($1,500 per year) for the current expenses of the association.

A little over a year ago a third street railway department was organized in Memphis, Tenn. This street railway property passed into the hands of the Newman syndicate. With the advent of the new management active efforts were made to raise the moral standards of the employes. With this in view the company accepted an offer made by the international committee of the Y. M. C. A., a most efficient secretary was secured, a department organized and a small equipment at an expense of $2,500 provided by the management. At the end of the first year the secretary reports 779 paid memberships, a daily attendance at the rooms of 375, and the average use of baths, 17. The total expenditures exceeded $3,100, and a balance of $142 remains in the treasury. At the end of the first year's work the testimony of one of the operating officials is that the men have gained in self-respect, are more loyal to the company, more efficient in service and for the most part heartily interested in the association.

The Newman syndicate owns street railway properties in Memphis, Birmingham, Nashville, Knoxville, Little Rock and Galveston. Last fall a convention of the officials of these several companies was held in Birmingham, Ala., to which Mr. Black, Y. M. C. A. secretary in Memphis, was invited. The first forenoon of the convention was given to the discussion of welfare work for employes. Mr. Black told about the work of the street railway association in Memphis, his remarks bringing out an interesting discussion. A committee of five was appointed to confer in regard to the question of welfare work on the several lines in the Newman syndicate. When this committee met the chairman, who is general superintendent of the street railway properties in Nashville, stated that he had been asked to prepare a paper on clubhouses for street railway employes and that he had attended the meeting that day with the expectation of reading this paper and giving the testimony which he had received from over 60 roads, about the value of clubhouses, but after listening to the remarks by Mr. Black he had no desire to present his paper because he was thoroughly convinced that the Y. M. C. A. was what was needed at each point, instead of clubhouses. Out of the conference came a report to the management at Birmingham and an association was organized there in May. A secretary is now in the field, very attractive and commodious rooms have been put in shape and occupied and the association starts with a membership of over 300. The work at Birmingham will be followed very soon by street railway departments at Nashville, where the company is now constructing a building for office and Y. M. C. A. purposes as at Little Rock and Knoxville.



Street Railway Young Men's Christian Associations—Recreation Room at Memphis, Tenn.

At Atlanta, Ga., our representative was invited to call upon the officers of the Georgia Light & Power Company, in company with the state secretary and the general secretary of the city association. These gentlemen had had several interviews with the officers of this company but had practically lost hope of being able to do anything toward an association because, as they stated, the management insisted upon giving all the privileges to the men without charge. The general manager and his superintendent of transportation were insistent upon providing free baths for the employes, but were practically willing that there should be a membership fee for any other privileges that might be provided. They were constructing an office building and a clubhouse which they said would cost about $50,000 and which would be ready for occupancy the middle of September. As soon as we agreed that they might keep their promise to their employes and provide them with free baths they were immediately ready to turn over their building, fully equipped, and secure a competent and experienced secretary to organize a street railway department.

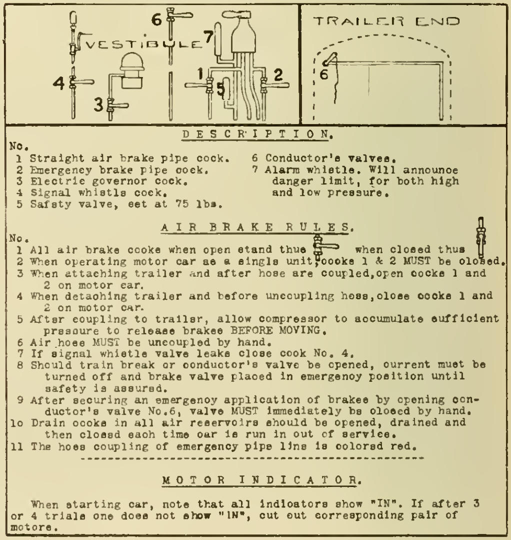
There are about 1,000 men available for membership at this point and an equipment will be provided here perhaps better than that possessed by any street railway association thus far organized. The company not only promises $100 per month for secretary's salary, but heat, light, water and the necessary supplies.

At Sherman, a street railway terminus near Los Angeles, Cal., another department has just been organized, quarters provided by the company and the salary of a secretary guaranteed.

The four associations organized report a membership of over 2,200 street railway men. The best argument in favor of the extension of this work is to be found in the existing associations, the size of the membership, the interest in the organization and the practical economic and valuable returns received from these associations by the several managements.

AIRBRAKE INSTRUCTION CARD.

For some years the Denver City Tramway has during the rush hours been operating trailers on several of the more level city routes. The brake equipment on these motor cars and trailers is the Westinghouse S. M. P. schedule. With this equipment there are straight-air and emergency pipe lines which necessitate two shut-off cocks. Rather than place these valves between the cars and place the responsibility on the conductor for the proper opening and closing of the valves when trailers are coupled to or uncoupled, the piping arrangement has been varied and the shut-off cocks placed


VESTIBULE
TRAILER END
1
2
3
4
5
6
7
6

DESCRIPTION.

No.
1 Straight air brake pipe cock.
2 Emergency brake pipe cock.
3 Electric governor cock.
4 Signal whistle cock.
5 Safety valve, set at 75 lbs.
6 Conductor's valves.
7 Alarm whistle. Will announce danger limit, for both high and low pressure.

AIR BRAKE RULES.

No.
1 All air brake cocks when open stand thus when closed thus
2 When operating motor car as a single unit, cocks 1 & 2 MUST be closed.
3 When attaching trailer and after hose are coupled, open cocks 1 and 2 on motor car.
4 When detaching trailer and before uncoupling hose, close cocks 1 and 2 on motor car.
5 After coupling to trailer, allow compressor to accumulate sufficient pressure to release brakes BEFORE MOVING.
6 Air hose MUST be uncoupled by hand.
7 If signal whistle valve leaks close cock No. 4.
8 Should train break or conductor's valve be opened, current must be turned off and brake valve placed in emergency position until safety is assured.
9 After securing an emergency application of brakes by opening conductor's valve No. 6, valve MUST immediately be closed by hand.
10 Drain cocks in all air reservoirs should be opened, drained and then closed each time car is run in out of service.
11 The hose coupling of emergency pipe line is colored red.

MOTOR INDICATOR.

When starting car, note that all indicators show "IN". If after 3 or 4 trials one does not show "IN", cut out corresponding pair of motors.

Denver City Tramway—Airbrake Instruction Card.

in the motorman's vestibule just below the engineer's valve. By this practice the motorman is made responsible for the proper setting of the valves at the time of coupling on a trailer. A clear statement of the rules for operating the various valves in the airbrake piping and a sketch with the valves shown, numbered and described is placed in a small frame in the vestibule so that the motorman may not become confused in handling the valves. This instruction card is 7½ wide by 8 inches high and is mounted above the window in the left hand side of the motorman's vestibule.

AN ENGINEER-CONSTRUCTOR DEFINED.

At the meeting of the electrical section of the Western Society of Engineers on November 16, Mr. George A. Damon, managing engineer of The Arnold Company, Chicago, read a paper entitled "What Is an Engineer-Constructor?" which was originally prepared to be read before the students of several engineering colleges in the middle west.

Mr. Damon said that the two dominant elements of modern industrial life, bigness and efficiency, had brought about the necessity for a technical organization ready to produce large results in an effective way. An engineer-constructor was defined as an organization to carry out any undertaking which requires for its completion a combination of conception, technical knowledge, construction experience and executive ability, and should be prepared to carry the work through from beginning to end without technical assistance from outside the organization. To be most effective it must have at its command the technical knowledge and the experience, the ability to analyze situations, the imagination to conceive unprecedented results, the ambition to improve existing systems, the honesty to spend money without favor or graft, and loyalty to itself and its client.

Such an organization should not be the maker of any equipment, nor be connected with the exploitation of any system of apparatus, and in its highest stage of development will not be connected except in a technical way with the financial interests which control the enterprise.

The organization of an engineer-constructor was compared with the development of a football team and various parallels were given to show the similarity of their requirements. The qualifications of each man must be studied and each one selected for his particular ability to solve the problems suited to his individual training and experience.

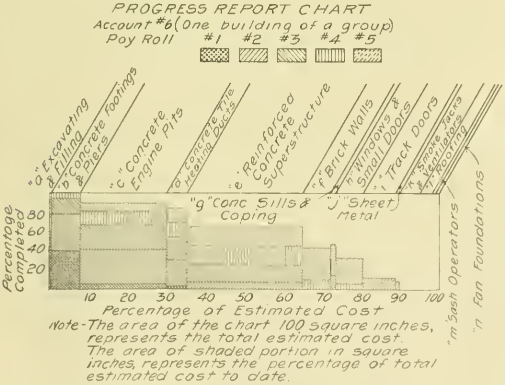


Figure 2.

To illustrate the possibilities of such an organization a contract for the design and construction of a large railroad repair shop was taken as an example, and an outline was given of the men required, with their chief duties, and the plan of organization of the company's forces engaged on such a contract was described. This plan of organization is shown by the diagram in Figure 1, which illustrates how the work in the field is directed by the central office. Several advantages of having the engineering and actual construction work done by the same company were pointed out.

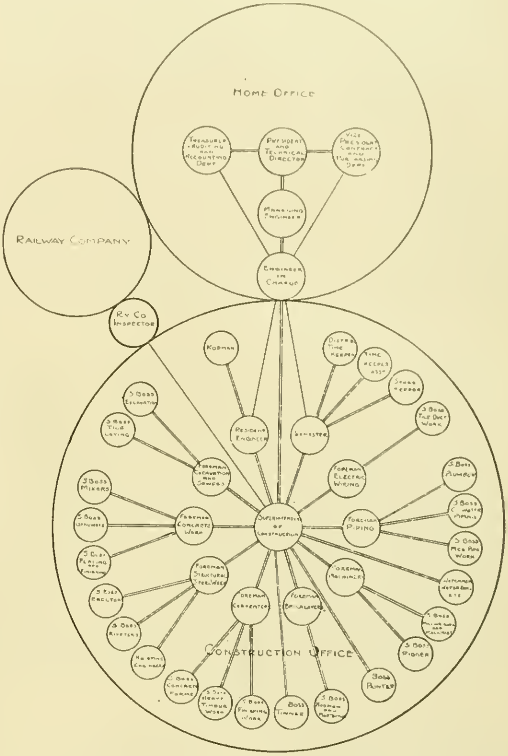


Figure 1.

The various systems employed to keep all concerned informed of each move throughout the progress of the entire work were described. Progress reports are compiled at stated intervals, giving in detail the progress of the work under each classification head. Not only do these reports keep the engineering force in touch with the progress of the work, making it possible more efficiently to ensure the work coming in proper sequence, but they also provide the information necessary to make decisions as to changes in detail, if necessary. These reports, together with a record of money expended at any date, give timely information as to the actual cost of the work as compared to the estimated cost. Figure 2 shows one of the charts used to record the progress of the work, representing the condition of the work at the time of the completion of the fifth payroll.

It was explained that the engineer-constructor usually works on the "cost plus a percentage" basis, that is, the work is done at actual cost and the company gets a fee for its services. If the engineer-constructor is thoroughly trained, efficient and honest, and has the control of a competent organization, the "cost plus a percentage" arrangement is better, but if the work is planned by an engineer and an architect and the actual building work turned over to a separate construction organization, then the "cost plus a fixed sum" plan no doubt has advantages.

Throughout the paper an effort was made to point out the necessity for a thoroughly scientific technical organization, and the benefits of complete co-operation. An interesting discussion followed as to the proper training required to fit the technical student for success in this field, opinion being about evenly divided as to whether the young man should fit himself especially along the lines of his natural aptitude, with a view to securing his first position in that line, or whether he should upon graduation seek a place which will give him the most experience, with the idea of "finding himself" then.

SPOKANE & INLAND EMPIRE RAILROAD.

Radiating from the city of Spokane, Wash., is an interesting system of railways controlled by the Spokane & Inland Empire Railroad Company. In the issue of the Electric Railway Review for September, 1906, page 550, was presented a description of the single-phase equipment of the southern divisions of this railway, and in the Street Railway Review for May and for August, 1905, were descriptions of the Coeur d'Alene & Spokane Railway, and the methods of handling its freight traffic.

The Spokane & Inland Empire Railroad Company is a consolidation of the Spokane Traction Company, owning 24 miles of track in Spokane; the Spokane Terminal Company owning extensive freight and passenger terminal yards and buildings in Spokane; the Cœur d'Alene & Spokane Railway Company, Limited, owning 43 miles of track between Spokane, Cœur d'Alene and Hayden Lake, Idaho; the Spokane & Inland Railway Company, with 34 miles of track in operation and 79 miles additional under construction between Spokane, Colfax and Palouse, Wash., and the Spokane Power Development Company, owning water rights on the Spokane river.

The following interesting information relative to the territory served the proposed extensions and the financial condition of the merger company has been furnished by Mr. J. P. Graves, president of the Spokane & Inland Empire Railroad.

Territory Served.

The Spokane & Inland Empire Railroad Company serves the territory known as the "Inland Empire," of which Spokane is the geographical and commercial center, lying between the Rocky mountains on the east and the Cascade mountains on the west, and including eastern Washington, western and northern Idaho and small sections of Oregon and British Columbia.

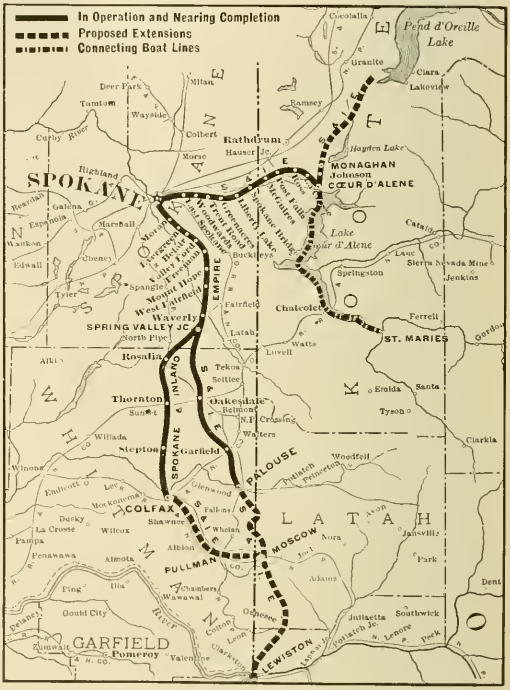
Spokane, the natural center of the Inland Empire, is the largest city between St. Paul and Seattle, having an estimated population of 85,000. All railroads serving the Inland Empire radiate from Spokane, and the Great Northern, Northern Pacific, Union Pacific and Canadian Pacific railroad systems furnish transcontinental service.

To the east and north of Spokane are mineral deposits of silver, lead, gold and copper, the production of silver and lead exceeding $20,000,000 annually from Cœur d'Alene mines to the east, and of copper and gold in excess of $20,000,000 from the mines on the boundary to the north. The shores of Cœur d'Alene and Hayden Lakes and their tributary rivers are heavily timbered with white pine, fir and other merchantable lumber, the annual cut approximating 130,000,000 feet.

To the south is the "Palouse Country," a section 150 miles long and about 30 miles wide, of which 75 per cent is under cultivation. This section produces about 25,000,000 bushels of wheat annually, 6,000,000 pounds of beet sugar, and immense quantities of potatoes, fruits and coarse grains. It is one of the most fertile sections of the United States.

To the east of the Palouse country and Spokane is about six billion feet of uncut white pine. At Palouse and Potlatch, which are served by the Spokane & Inland Empire Railroad Company's lines, are sawmills with a daily capacity of 800,000 feet of lumber.

The Cœur d'Alene & Spokane division of the Spokane & Inland Empire system occupies the valley of the Spokane river for 34 miles, from Spokane to the city of Cœur d'Alene at the outlet of Cœur d'Alene lake, where connection is made by fast steamers with the numerous towns upon the lake and its tributary rivers. At Harrison, Idaho, at the head of the lake, the steamers connect with the Oregon Railroad & Navigation Company, thus forming the shortest through line to the extensive Cœur d'Alene mining country. From Cœur d'Alene a branch line extends 9 miles north to Hayden Lake.



Spokane & Inland Empire Railroad—Map of Routes.

The Spokane & Inland division, now nearing completion, extends from Spokane to Colfax, Wash., 76 miles, and from Spring Valley to Palouse, Wash., 37 miles. This division will be in operation about January 1, 1907. It is the intention to extend this road to Moscow, and eventually to Lewiston, Idaho, in the Snake river, which is a navigable stream and affords a direct water outlet to Portland, Oregon, and to Puget Sound.

The company has under construction at a point nine miles below Spokane, on the Spokane river, a concrete dam, 60 feet high, and a concrete-steel hydro-electric power house which, when completed, will have a generating capacity of 9,000 horsepower. This plant will be completed during the next 12 months.

Financial.

The cost of the properties when the railroad to Colfax and Palouse is completed will be in excess of $8,000,000, against which there will be outstanding $3,959,000 in bonds, including $1,216,000 of prior liens. The equity of more than $4,000,000 has already been provided by the stockholders and expended on the property.

The earnings derived from the operation of 24 miles of city road and 34 miles of road from Spokane to Cœur d'Alene were as follows for the six months ended August 31, 1906: Gross earnings, $236,822.17; operating expenses, including taxes, $137,085, and net earnings, $99,737.17.

POLYPHASE SYSTEMS OF GENERATION, TRANSMISSION AND DISTRIBUTION.*

BY M. A. SAMMETT, A. M. CAN. SOC. C. E.

Every electrical development possesses some typical peculiarities which should be the determining factors in the selection of the frequency of the system as a whole, as well as the selection of the generating and distributing systems as to phases, that is, whether it should be two or three-phase. These are the problems with which we will concern ourselves in the discussion of polyphase systems, with a transmission line of 100 miles or less and pressures up to and including 50,000 volts at the receiving end.

Whatever the generation and distribution, the transmission of power is always accomplished by three-phase. This arrangement allows of most economical transmission of power with a given drop in the line. While the transmission of power is invariably accomplished by three-phase, the generation and distribution is often by two-phase.

Modern engineering practice shows, however, the abandonment of the two-phase generator in connection with hydroelectric power houses, where power is to be transmitted and consequently transformed from two to three-phase. The common belief of the simplicity of the two-phase generator and switchboard is more imaginary than real and came about as a result of clinging to the more familiar two-phase generator which at the time just preceding the era of generation for transmission purposes was the standard apparatus, answering best the needs of small central stations with a lighting load, the amount of power forming a very small proportion of the total load.

It must be admitted that a two-phase system for distribution purposes is somewhat simpler to operate than a three-phase system. The two phases may be controlled independently for single-phase lighting circuits, without any appreciable effect of one phase on the other.

In the case of motor connections on two-phase circuits, all that is necessary is to connect the two transformers with the primary coils to the line, and the secondary coils to the motor. No special attention is required as to polarities of transformers. The impedance of transformers need not be the same for proper division of load, as is essential in connections of three-phase installations.

It was this at first sight simplicity which appealed to the engineer in laying out the first hydro-electric power houses, and even at the present time some engineers persist in their preference for the two-phase generators, and at the receiving end go through another transformation from three to two-phase in order to supply two-phase current at the distributing end.

Let us take up the generating plant first and see which of the two systems, three or two phase, is more efficient as well as more economical.

Power House.

It is pretty well known that for a given capacity, speed and voltage, at a given frequency, the three-phase generator will prove the more efficient machine. Manufacturers standardizing apparatus use the same frames and punchings for the two different types. This enables the manufacturer to turn out a better three-phase generator as to efficiency and heating, retaining the same core loss. Should he, however, select to keep the same density in the copper of the three-phase as in the two-phase machine, he will be in a position to reduce the magnetic flux by virtue of the larger number of turns that can be accommodated in the same slots, and thus considerably reduce the core loss. Inasmuch as the core loss in machines of large capacity is considerably greater than the copper loss, this will result in a material increase in the efficiency of the generator.

Switchboard.

Taking up next the switchboard, we will find that the only advantage the two-phase board has in comparison with the three-phase, is the saving of one ammeter.

All busbars, oil-switch contacts and switch compartments, all cables from generators to switchboard and from the board to the transformers are reduced in the ratio of 4:3, and while 15.6 per cent larger cross-section of copper is required in the instance of the three-phase installation, maintaining the same current density, the 25 per cent saving in the number of individual parts necessary for the installation will be in favor of the three-phase board.

Transformers.

The use of two transformers for a given load allows a greater individual transformer capacity, and therefore a more efficient transformer. This would have been a decided advantage, favoring the two-phase system, were it not for the fact that the transmission of power is to be by three-phase. To accomplish this phase transformation by the well-known Scott connections, unless all transformers are provided with a heavier high-tension winding, the transformer capacity would of necessity be reduced, due to a higher current in the three-phase winding, namely, that of 115.6 per cent of the normal current. Should, however, the transformers be designed with provision made for this higher current, it would necessitate larger transformers, or in other words, a more expensive installation. Beside this increased transformer capacity, another disadvantage must be added, that of a possible resonance with T-connected transformers for two-phase three-phase transformers. Whenever one of the phases is open, due to a failure of making proper contact of various switches or any of the auxiliary connections, the high reactance of the high voltage transformer will get in series with the capacity of the transmission line and a resonance is likely to take place with the consequent disastrous results.

We have shown the advantages of using a three-phase generator. This advantage is further augmented by the possibility of using transformer connections with which the danger of resonance is eliminated. Of the transformer connections in vogue, there are two which are free from the danger of resonance, namely, delta to delta for step-up and delta to delta for step-down, or delta to Y and Y to delta. Neither of these two has the objectionable characteristic of resonance, and while the delta to Y and Y to delta is selected for transmissions where highest voltages are made use of, it is the delta to delta and delta to delta which gives the most reliable service. With the latter style of connections, should one of the transformers fail, as soon as this transformer is cut out, the service may be restored. This latter connection, which insures both continuity of service and freedom from resonance, is introduced now on one of the 60,000-volt transmission lines and is destined to become the standard, inasmuch as high-tension transformers of 60,000 volts as well as the insulators, especially if the latter are carefully selected and tested, have the requisite factor of safety, making the resort to the Y connections, at a sacrifice of continuity of service, unnecessary.

Distributing System.

The considerations which held true in the discussion of the transmission line will also hold true in the distributing system. The three-phase delta connections should be made use of, since on motor service a complete shut-down due to a failure of one transformer must be carefully guarded against. Again, the three-wire three-phase distribution will result in a saving of 25 per cent of copper and insulators. It will reduce the maintenance expense by the same percentage.

The advantages thus enumerated show clearly the desirability of three-phase distribution from the purely commercial standpoint and still more so from the point of view of reliability and permanency of supply. Some engineers object to the three-phase distribution on the ground of the difficulty of balancing loads. This objection must not be given much importance. With the mixed load of lighting and power, the power load has an equalizing tendency on the balancing of the system, and with some attention given to the proper division of the connected lighting load no difficulty will be encountered.

The station records should be carefully watched, and occasional readjustment of the load, based on station records as well as tests of individual installations, will permit of as careful a balance as one may desire.

The comparison of motors can best be made from a summary of a convention paper by Mr. Bradley McCormick, read recently before the American Institute of Electrical Engineers. Given two similar frames without windings, how shall the two-phase and three-phase windings differ in order to secure proper operation? What will be the comparative losses if the two machines are given the same rating?

1. A two-phase machine should have 22 per cent more conductors per slot than the corresponding three-phase Y connected machine, designed for the same voltage and flux per pole.

2. The magnetizing current is the same in both the

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*Abstract of paper read before the Electrical Section, Canadian Society of Civil Engineers, November 15, 1906.

two and three-phase machines when expressed in percentage of the current, which corresponds to the full load output.

3. The copper loss of the two-phase machine is 12 per cent higher than that of the three-phase.

4. The leakage factor of the two-phase machine averages 25 per cent greater than that of a three-phase machine, therefore the power factor is lower.

Actual results show from 1 to 3 per cent lower power factors.

These considerations show that the two-phase machine will have a higher temperature rise as a result of a higher copper loss. For the same reason the efficiency of the two-phase motor will be lower. The slip of the two-phase machine will also be greater. Tests and theoretical calculations show 20 per cent greater slip.

Thus we see that the two-phase induction motor is a poorer motor for the central station company, due to a poorer power factor. It is also less advantageous to the power user, as a smaller efficiency means a larger motor input for a given output. The higher temperature rise will result in a shorter life and larger slip will mean a greater fluctuation between synchronous, partial and full load speeds.

While the three-phase service should be made standard, two-phase motors may be used by the aid of three-phase two-phase transformers. This, however, should be discouraged, as such transformers require special taps, which make them more expensive, especially so when core type transformers are used. It also means the carrying of a stock of these special transformers as spare units.

Frequency.

The frequencies most widely used on this continent are those of 60 and 25 cycles. While other frequencies are made use of, these are the predominating ones.

As far as the transmission line is concerned, the lower the frequency, the less the induction drop, the smaller the charging current and the better the regulation. It is a foregone conclusion that as a purely transmission problem we will have to adopt the 25-cycle frequency.

The speeds of turbine-generator units are limited by the number of wheels, type, head and output. Therefore a wider range of speeds permissible with a 60-cycle system will enable the selection of the most efficient generator-wheel combination.

The switchboard under the two frequencies is unaffected. All meters and potential and current transformers are designed for satisfactory operation on frequencies from 25 to 125 cycles.

Transformers built for 25 cycles are a much more expensive piece of apparatus as well as less efficient than when built for 60 cycles. Considering that there is with a generation, transmission and distribution of power a total transformer capacity equivalent to from three to four times the capacity of the generating apparatus, one will readily see the advantage of a higher frequency. This, however, must not be done at a sacrifice of other considerations, such as excessive charging current in transmission or extremely poor regulation.

With incandescent lighting, while 30 cycles is the limiting frequency, 40 cycles is unsatisfactory when moving objects are viewed by it. On this continent 60 cycles is the standard frequency for such a service, while 50 cycles is European practice. For arc lighting 40 cycles is the limiting frequency. Lower frequencies are made use of in the application of the recently developed mercury vapor converter and magnetite lamps. This new system, however, will probably have to go through a process of further experimenting. The conservative investor will still select the higher frequency series alternating enclosed arc lamps.

Analzyed from the standpoint of frequency, induction motors show characteristics which make it difficult to decide as to the best motor. As a rule lower frequency motors are adaptations to standard 60-cycle frames and punchings, hence their performance does not show characteristics of the same high standard. Of course the low frequency motors have advantages of their own, such as better starting torque, higher instantaneous but not continuous overload capacity and lower speeds.

The principal factors in favor of the 60-cycle motors are better continuous overload capacity and also a cheaper product commercially as a result of higher speeds. Therefore, with equally good performance as to efficiency and heating, the 60-cycle motor will still be ahead of the 25-cycle motor.

The suitability of low frequency synchronous converters for railway work is a well established fact. While 60-cycle synchronous converters are used for such purposes, they are rather an exception and their operation is less satisfactory. What should then, under the circumstances, be a desirable way of supplying street railway loads without resort to frequency changers? The latter are out of the question, due to excessive cost, beside the great reduction in the efficiency of the systems, resultant from their use.

Motor-generator sets may be and are advantageously used in this connection, and while not possessing the advantages of 25-cycle synchronous converters, have features which make them particularly suitable for use on long distance transmission systems, permitting of a partial or complete control of the power factor of the system depending as to whether induction motors or synchronous motor sets are used.

Wherever large capacity is present, due to long transmission lines, induction motor generator sets of large size can be used to great advantage. For perfect control of the power factor of the transmitted power, synchronous motors should be employed, as in this case the regulating of the field excitation allows of a close control of the power factor of the transmitted energy, allowing the maximum energy for a given current, and under certain conditions will permit of carrying the load at unity power factor in the generating and transforming apparatus and transmission line.

While the synchronous converter is the most efficient of the three means of supplying railway loads, whenever this load constitutes only the minor portion of the total output of the plant, the interests of the lighting and power load cannot be sacrificed for a most efficient conversion of the alternating current to direct current for railway purposes.

In our discussion of frequency we may conclude that for a mixed load of lighting and power with a railway load not exceeding one-third of the total power generated, 60 cycles will be the frequency to select.

The regulation and capacity or charging current are decidedly in favor of the 25-cycle transmission. The results for the 60-cycle system, while considerably in excess of those at 25 cycles, are considered quite normal for commercial purposes, and inasmuch as the increase and decrease in the load is gradual the regulation is well within control of the central station operators or automatic devices.

As to the railway load, this had better be carried on a separate circuit, whenever a multiplicity of circuits is used in transmitting the power. In our case there are three transmission circuits.

Considering the successful operation of one of the long distance transmission lines of 150 miles in California, where the charging current forms 40 per cent of full load current, and where the regulation is 40 per cent at full load, 80 per cent power factor, we need not hesitate to operate our line with a regulation of 23 per cent, 80 per cent power factor.

The power factor of the system, however, is to a large extent within the control of the operating company, as it may recommend to power users such apparatus as will best answer the purposes of the system as a whole. Beside this, by employing synchronous motors running as rotary condensers, it will be enabled to regulate the power factor of the system and keep it if necessary at unity. These synchronous motors running idle, used supplementary to the synchronous motor-generator sets, will allow of a perfect control of the power factor of the system, reducing the regulation to 9 per cent under full load condition.

In conclusion, we will say that under the conditions as stated, for a mixed lighting and power load, with a railway load not exceeding 33 per cent of the total output, a three-phase, 60-cycle system should be employed throughout and all transformation should be accomplished by delta to delta connection.

Fireproof Insulating Material.

An insulating material which is stated to possess high dielectric strength, to be fireproof and non-shrinkable is the subject of a patent issued recently to Mr. George Kelley. The material first formed consists of five parts by weight of pontianak gum and ninety-five parts of liquid glass; that is, silicate of sodium or silicate of potassium. The liquid glass acts as a solvent for the gum, the resultant combination having excellent adhesive qualities. Sufficient mineral wool is moistened with the above combination to make a stiff but plastic body. The material is formed into sheets or molded articles which are subsequently vulcanized under pressure until the desired degree of hardness is attained. It is stated that the article thus obtained is suitable in every way for insulating purposes.

The Indianapolis & Louisville Traction Company is making good headway with the construction work on its line between Sellersburg and Seymour, Ind. The car barn and power house, which are being built at Scottsburg, will soon be under roof. The poles and steel have been distributed along the line as far north as Austin.

PIPING AND POWER STATION SYSTEMS—XXIV.

BY W. L. MORRIS, M. E.

Heater Water Supply from Low-Pressure System.

The regular supply for open heaters used in non-condensing plants having their own water supply such as a well or stream, is taken from the low-pressure system. The same pump that raises the water for the low-pressure system ordinarily discharges into a low-down service tank which is placed at a sufficient height to supply the heater. As the pressure on the low-pressure system is ordinarily quite low, possibly five pounds, this makes it necessary to use plumbing fixtures of a comparatively large size. The higher the tank is placed the greater will be the steam loss in raising the water to this tank, as practically all the water is used for boiler feed.

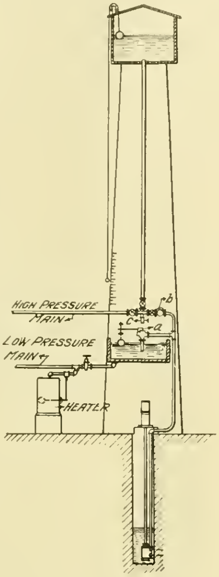


Figure 229—(G4-1).

If it is necessary to have a high tank for fire service it will be more economical as regards the use of steam for pumping to instal two tanks, one at an elevation, say 100 feet above grade, and the other at an elevation of 12 feet above grade. Such an arrangement is shown in Figure 229-(G3-1). The same pump may be used to supply both tanks making use of a float-operated valve, a, for the lower tank and a check valve, b, in the discharge to the higher tank. The valve, a, should be full-open or full-closed, allowing the free travel of the float on its rod. With such connections when the valve, a, is open the high head will at once be taken off the pump discharge and kept off until the lower tank is full and the valve again closed. Then the pump will slow down and discharge its surplus into the higher tank, the check valve, b, opening and allowing the water to pass. With the tanks thus arranged the pump could be so regulated that it would supply about the amount of water required for boiler feeding and not discharge to the higher tank more than five per cent of the water raised. Valve, c, can be placed in the high-pressure line to permit drawing off part of the water in the upper tank in case it becomes too full.

The lower one of the tanks can be used for reserve boiler-feed water and should be made much larger than the upper tank with the suction to the pump so arranged that water can be fed to the fire main, thus fully utilizing the water from both tanks and not requiring the expenditure necessary to make a structure for supporting all the water at the higher elevation.

However, if the tower is arranged to store all the water at the high elevation, then an open heater should not be used. A closed heater may be placed either in the line from the tank to the pump or from the pump to the boilers, less pressure being placed upon the heater if it is connected between the tank and the pump. If a closed heater is used the full amount of head on the feed-pump suction is utilized and the work imposed upon the pump that much reduced. Since the installation considered would be non-condensing with a surplus of exhaust steam there should be, as regards heat units transmitted to the water, no perceptible loss if a closed heater is used, providing, of course, that the heating surface of the heater is ample.

Heater Water Supply from Special Pumps.

Referring to Figure 225-(G1-1) it will be noted that a special pump is provided for supplying the open heater from the hot-well of the jet condenser. If the plant has more than one condenser and more than one pair of centrifugal pumps it is quite probable that water for the heater will be available at all times. If it is necessary to operate non-condensing for a part of the time it will be found advisable to use a separate drive for the heater supply pump and arrange the connections so that this pump can take suction from the intake as well as the hot-well. The independent condenser pump No. 3 in Figure 228 is so arranged and permits the use of the heater at all times, which is a very essential requirement.

Instead of using a power-driven pump, as shown in Figure 225, the heater supply pump may be operated in unison with the boiler-feed pump as shown in Figure 230-(G5-1). The feed pump illustrated is a regular pattern ram-type pump with a connecting boss, a, so designed that the independent heater pump drive may be dropped into it. The cylinders, b, are for the low-pressure heater supply and adjustable lock nuts, c, are placed at the end of the piston rod to regulate the travel at d. In designing the pump the piston in the cylinder, b, would be made a trifle larger than that of the feed pump, and by observing the overflow of the heater the stroke can be regulated, reducing it by increasing the lost travel, d, by running the lock nut, c, toward the end. In this way the overflow can be reduced to a very slight amount, which is just sufficient to run off any oil that may lie on top of the water in the heater. The joint, e, permits disconnecting the pumps, b, when the heater is out of service, thus enabling the feed pump to take water from the hot-well direct.

This system of pumping water to the heater requires no automatic devices for its regulation, the supply pump having practically the same capacity as the feed pump. The economy is increased as the duty of this light-running pump is put upon the heavy-service pump, being equivalent to raising the water pressure in the high-pressure pump about 10 pounds above that which would ordinarily be carried.

Heater Water Supply from Injection to Surface Condenser.

It is the usual custom for surface condenser manufacturers to furnish as a part of the condenser equipment, the connection, b, shown in Figure 226-(G1-2). This connection with its valve offers a passage from the circulating water space to the vacuum chamber of the condenser. Unless the valve, b, can be so located that it is convenient for the boiler-room operator, it will be found advisable to obtain water for the heater in some other way, possibly by taking it from the fire-pump suction through a conveniently located regulating valve and discharging it into the condenser.

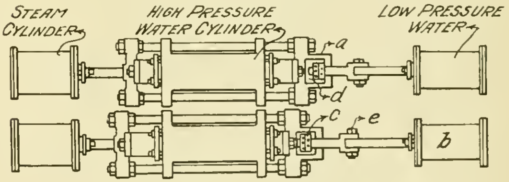


Figure 230—(G5-1).

The heater supply connection should be used for handling only small amounts of water, because if the steam condensed is only a comparatively small part of that generated, the addition of a large amount of water will unnecessarily increase the work of the condensation pump. If it is necessary to add water in larger quantities such additional water should be delivered direct to the heater either from the low-pressure system or some other available source.

It is often found advisable to neglect a small loss rather than to provide a more complicated system which may be somewhat more economical. For example, if 25 or 30 per cent of the steam were being condensed elsewhere than in the condenser it ordinarily would be more simple and in many cases as economical to deliver the additional water required direct to the condenser, even though it were necessary to pump it out again. In this way one supply may serve both purposes. If, however, make-up water is at all times available from some source that does not necessitate the operation of extra apparatus, this supply should be used.

There are many minute economies in station operation that cost more for their provision and care than can be realized from their use; too many devices to secure small economies are apt to keep the operator so fully occupied that larger sources of economy are neglected.

Low-Pressure Water Main.

Unless the plant be of smaller capacity than one or two hundred horsepower a low-pressure water main is usually provided in station piping. It is quite essential in the larger plants to have a low-pressure supply other than that afforded by the city water mains. About the only use for which city water is essential is for drinking purposes.

If the plant is operated condensing the intake water will be found suitable for the low-pressure service. The use of discharge water for this service is quite unsatisfactory for many of the purposes to which the water is put. Discharge water is suitable for filling and washing boilers, for wetting down ashes and for similar services, but if there is a supply needed for water-cooled jackets, engine journals, dry-vacuum pumps, etc., injection water will be found more suitable.

In considering the details of low-pressure water mains there are many features to be taken into account. Water should be available at all times for the system of piping which is always at low pressure. There should also be available water for cleaning boiler tubes with turbine cleaners, this service requiring a high pressure. Water for fire lines must always be available at a fairly high pressure, say 125 pounds per square inch. To permit the continuous use of low-pressure water at about 15 pounds pressure it is necessary to have either a pump on the service at all times or to use a storage tank. A very satisfactory arrangement is had by using two feed pumps arranged so that one can supply the feed main. No water should be taken from this pump for any other service. When not in reserve as a feed pump the second pump should supply water for tube cutting.

With this arrangement the fire pump would be on the fire and the low-pressure systems, maintaining low pressure on all lines and a tank would supply water for the plumbing fixtures and only such few services as the high pressure would injure. All low-pressure hose lines could be taken from the fire main and the pressure be regulated with hose valves for such rare cases as those when the fire lines would be under heavy pressure. This arrangement will enable the use of the entire fire system for general hose service and give the fire-pump a continuous light duty. The low-pressure system can be made of standard fittings, but some provision should be made to protect this line against the possibility of high pressure such as would be the case when changing the set of the governor on the fire pump. This precautionary measure might be accomplished by using a pressure-reducing valve and a relief valve.

Low-Pressure Water from Pump.

The low-pressure pump should have a governor that can quickly be set for high or low pressure; this can be accomplished by using a weight that can be removed in one piece, so that the high pressure ordinarily desired and the low pressure are fixed by the handling of the single weight. The advantage of this arrangement is that when the fire pump is supplying the low-pressure water the simple movement of changing the weight will put the pump on the fire-main service without handling any valves.

Low-Pressure Line to and from Water-Tank.

The most convenient arrangement for a water tank is to place it between the trusses in the engine room and support it as shown in Figure 231-(H3-1). An iron tank located as shown and open to the engine room is very objectionable on account of its "sweating." The high temperature of the engine room admits of the air carrying a large amount of moisture, this being governed by the amount of escaping steam and by weather conditions. The moisture in the air is so readily condensed on the sides of the cool water tank that the outer surfaces of such tanks are usually quite wet. This causes much trouble from dripping. When a tank is not wet and dripping it exposes a badly disfigured surface due to its former sweating. Placing the tank in the boiler room only adds to the difficulties by the water in the tank taking up boiler-room dust.

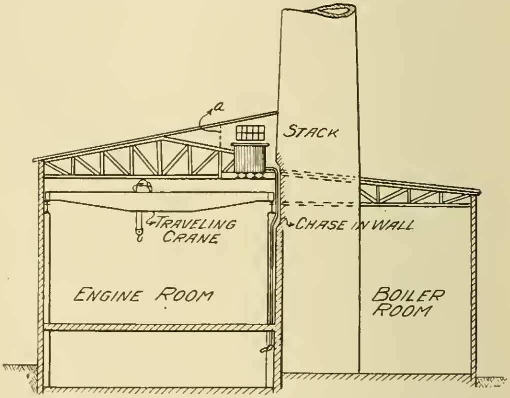


Figure 231—(H3-1).

Another method of supporting the tank is to place it on a division wall over the top of the roof. This is a troublesome arrangement in many ways; the pipes to the tank, also the tell-tales, etc., must be run through the roof, the openings for which afford opportunities for leaks. With a tank so placed it would be necessary in extremely cold weather to make some provision against freezing.

A wooden tank would be quite as objectionable, if not more so, than an iron one. Such tanks do not sweat, but it is next to impossible to keep them tight in such a hot place as the upper part of an engine room. Probably the most satisfactory tank for such a location as shown in Figure 231 is a box of matched lumber sufficiently strong to hold the water and lined throughout with sheet copper having well-soldered joints. Such a tank will be found as easy to make tight as an iron one and no difficulty will be experienced from dripping.

Another method of overcoming the trouble from dripping is to enclose the tank in a "room" between the trusses, using, if desired, a metal floor and the partition, a, shown dotted in Figure 231. This room may also have windows opening to the outside of the building. By the use of such a room the engine-room air is prevented from coming in contact with the tank and by manipulating the windows the air around the tank can be kept at a low temperature, thus permitting the use of a plate-iron tank without the difficulties previously mentioned.

There are three methods for supplying such tanks with water. The first is by the use of a float and lever connected to the steam pipe of the pump (or an electrical controlling device). The second is by the use of a float and lever arranged to operate the water valves in the line discharging into the tank. The third is by means of a float, pulleys and tell-tale placed on the wall so that the operator can see and control the feeding arrangement by hand. There should be an overflow emptying either into a funnel in a conspicuous place or in such a manner as to attract the notice of the operator.

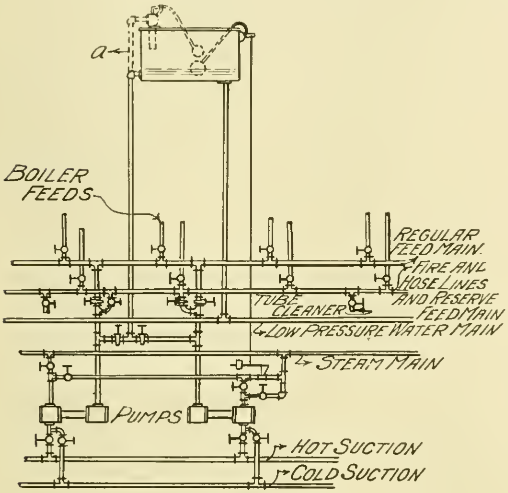


Figure 232—(H3-2).

The float control of steam valves is the most satisfactory method of regulation, if the pump can be kept constantly in use for this particular service. This requirement can generally be arranged for, as there are only two water services regularly needed for station use; boiler feed and general water supply, as shown in Figure 232-(H3-2). With the arrangement as shown the auxiliary main would be under low pressure and would be connected with the pump discharging into the tank; in fact it would be supplied from the tank. It will be noted that the low-pressure main is in no way connected with other lines that at times carry high pressures. Thus the arrangement avoids the possibility of water under high pressure being let into the low-pressure system. The pumps are shown with each having similar connections for suction, discharge and steam openings. This allows the use of either pump for boiler feeding, and the selection of the pump which is in the best condition for use in boiler feeding while the other is used for tank work.

With a system as shown the auxiliary feed mains could be used for boiler feeding in place of the regular feed mains and the hose lines would then be under boiler pressure and filled with hot water. For times when it would be desirable to shut the valves to the hose or fire lines and in case of fire, the tank regulating valve would be open, even though it necessitated feeding the boilers with cold water. The plant meanwhile would be in operative condition which is the only alternative to consider under emergency conditions. While running the tube-cutting turbine it would be necessary to use the tank pump on the fire main under fairly high pressure, but while the tank pump is doing this duty the tank itself will supply the low-service system. The fire and hose lines could be under high pressure with cold water and if the tank had capacity for about ten hours' supply to the low-pressure service, no difficulty would be experienced while cutting tubes. It is even true that considerable time might be taken in repairing a pump before it would be necessary to replenish the supply in the tank and also that by the use of the tank one pump in extreme cases could be made to serve for boiler feeding, tank filling and similar duties until the disabled pump was in operating condition.

The use of a float for operating the water valve offers many desirable features and simplifies operation duties. The pump discharge, a, shown dotted in Figure 232 is carried to the top of the tank and connected with a float which in turn controls the discharge. With the discharge so arranged the steam is carried direct from the main to the pump which has a governor that can be set for a suitable pressure sufficiently in excess of the tank pressure to insure raising the water to the tank level. Thus, if the tank pressure were 15 pounds, the pressure on the auxiliary main would be kept at about 25 pounds and the float valve would be allowed to control the water to the tank. At the time of a fire, or when cleaning tubes or at such other times as a pressure of more than 25 pounds is desired in the fire main, such pressure could be had by altering the set of the governor without changing any of the tank arrangements.

As long as the fire main is kept under about the same pressure as that supplied by the tank there will be but little wear at the float valve on the end of the pipe, a. However, if the difference in pressure is considerable some special provision should be made so that the float valve will not cut out its faces. The most serviceable arrangement to meet these requirements includes provision for allowing the float a considerable range of travel, so that when the float is close to the bottom of the tank the valve will be fully open and when the water is near the overflow point the valve will be fully closed, having no intermediate position.

Figure 233-(H3-3) illustrates a valve so constructed and including in its design a small waste valve attached to the float together with a piston-operated valve for regulating the flow of water to the tank. In this device when the main valve is open the waste valve is also open; the free travel in the valve stem, a, allows the float to take the extreme range before the valve is operated.

Where the supply tank is fitted with a tell-tale and has a sufficient capacity for many hours' service it is common practice to use a hand-control, either starting or stopping the pump that supplies the tank or by throttling the water supply to the tank if the main from which it is supplied is constantly under pressure.

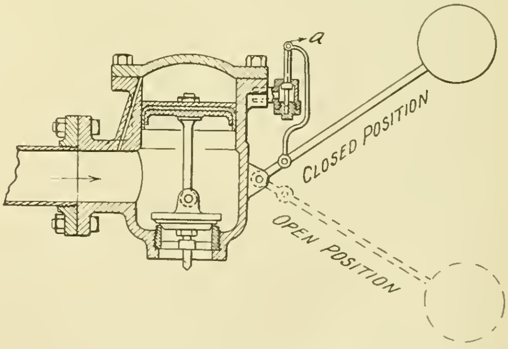


Figure 233—(H3-3).

Another method of storing water and one especially suited for pressures higher than those obtained by the use of a gravity tank, employs an expansion air tank. This tank may be placed in the basement, and if the station is equipped with an air compressor the larger portion of the tank's volume may be utilized for storing water. For example, if, at any time, the tank be ¾ full of water at 75 pounds pressure and then be emptied of the water, there will be a pressure of 7 pounds per square inch when the water has been discharged, these pressures being considered as above atmospheric value.

To assure the maintenance of a fairly even pressure it is necessary that an expansion tank be quite large, even though the quantity of water to be withdrawn at any one time is relatively small. To obtain an allowable pressure drop of 10 pounds with the tank earlier mentioned as carrying 75 pounds pressure, there would be required a cubical contents of 36 cubic feet for each cubic foot of water to be withdrawn.

A pressure tank is especially useful in connection with the pump doing constant service and under the control of a governor; the tank allows the pump to gradually increase and decrease its discharge without sudden pressure changes and the consequent shocks. A gravity tank, however, is more satisfactory for power-plant uses than a pressure tank, because the air-pressure tank is under more severe stress than any other part of the water system, while a gravity tank is under the least pressure of any part of its system. The expense of supporting a gravity tank is much less than the original cost for building a larger tank which must withstand higher pressure.

As a gravity tank is quite essential, provision should be made for its accommodation when the structural work is designed. The cost of installation will thus be reduced materially. Ordinarily it will be found the cheaper method to allow the contractor for the structural steel to furnish the tank, tank-room floor, partitions and such ladders as may be required to reach the tank room. In designing the building walls, if a traveling crane is used which will run close to the face of the wall, a chase should be left to accommodate the piping for the water supply to the tank, and for an overflow and possibly a separate discharge pipe.

Low-Pressure Water to Heater.

Ordinarily it will not be found good practice to supply low-pressure water to an open heater since the low-pressure service is generally cold water and at pressures in the neighborhood of fifteen pounds. If the plant is of the condensing type other means are possibly available. If the plant is of the non-condensing type a loss will be occasioned by pumping the supply water against a 20-pound pressure and discharging it to atmospheric pressure.

Under these conditions if the plant being considered has 3,000 horsepower of boiler capacity there will be about 90,000 pounds of water raised about 40 feet higher than necessary, or a loss equivalent to 3,600,000 foot pounds per hour, which equals 60,000 foot pounds per minute, or 2 horsepower. If the pump uses 100 pounds of steam per horsepower hour the loss would then be 200 pounds of steam per hour. This extra work would require about 30 pounds of coal per hour or 720 pounds per day of 24 hours and at $2.00 per ton or .1 cent per pound the loss will be 72 cents per day or $262.80 per year; thus an investment of more than $1,500 will be justified to save this loss. Such an amount is more than sufficient to cover the cost of any device necessary for the purpose. If the plant is non-condensing and can use all the exhaust from the pump in the heater, then the steam loss would be much less, but the loss by the use of cold water rather than condenser discharge water, would bring about still another loss.

For a non-condensing plant the arrangement shown in Figure 230-(G5-1) is simple and economical, using as it does the heater supply pump connected with the feed pump. It is safe to assume that the ordinary float with the float-controlled valve as furnished with open heaters, will require as much attention and cause as much annoyance as the low-duty water cylinders added to the feed pump. If there is but one feed pump with its heater pump attached then it will be advisable to run a branch from the low-pressure main to the heater. This branch can be used in case of repairs such as would necessitate shutting down the heater pump. The saving that may be secured during such short intervals will not pay for the investment in a reserve heater pump.

Low-Pressure Water to Engine Journals.

Many of the large engines are provided with hollow journal shells and arranged for passing water through these chambers to carry off the heat generated by friction. If a large quantity of oil could be circulated through such journals and caused to pass over the hot surfaces, it would accomplish the same result. This procedure, however, is impossible as the weight of the moving parts sliding in the journal prevents more than a film of oil passing over the surface which requires cooling. The water chamber is not similarly restricted, the volume that can be passed over its hot surfaces being determined by the size of the connections and the water pressure. The inability of oil to cool journals, even when fed in a stream, is fully demonstrated in the cases of hot bearings that necessitate shutting down the engine and cooling the journals before again starting. However, these same journals after starting up may continue to run cool with an ordinary supply of oil.

Water cooling does not take the place of oil cooling, but is provided to maintain journals at lower temperatures than would otherwise be possible. Water cooling also provides a means for lowering the temperature of a journal that starts to heat, thus permitting the engine to stay in operation when without water cooling shutting down would be necessary. Water-cooled journals are not essential when oil is liberally supplied from an oiling system, and from the standpoint of economical operation much less expenditure of power is required to increase the oil supply than to handle the water necessary to reduce the heat caused by insufficient lubrication. In other words it would cost less to remove the cause of the trouble than to reduce the trouble caused.

As there are times when the temperature in the engine room is so high that cool journals are impossible without resorting to the method of water cooling, facilities should be provided for supplying water to the journals. The lower sections of the main journals are the only bearings that ordinarily are water cooled. These bearings lie in close contact with the shaft at all times, thus preventing a free supply of oil to their sliding faces. The side cheeks and caps, also the crank and cross-head pins are in close contact only part of the time, which permits oil to flow between their faces every time the piston reciprocates.

In designing a water-cooling system for journals consideration should be given so that the pipe connections will be free to expand and contract at the connections with the journal. This allowance is not on account of heat, but on account of the movement of the lower shell. If the side cheeks are quite free from the shaft it will move crossways in the bearing and cause the bearing to move also. This movement cannot be taken up completely or the journal will heat, but it should be reduced to the least possible amount, thus retaining the lower bearing in a form that will correspond to that of the shaft. There is sure to be some pounding in the journal and this continual jar will break pipe connections. The nipple and possibly the next piece of pipe away from the journal should be extra heavy and if the opening in the journal is large it will be found advisable to reduce the diameter of the pipe at the first L to a size smaller than the regular line to the journal.

(To be Continued.)

RECENT ELECTRIC RAILWAY LEGAL DECISIONS.

BY J. L. ROSENBERGER, LL.B., OF THE CHICAGO BAR.

Injury to Lineman By Overturning of Wagon Caused By Fellow Servants.

Hayes v. Jersey City, Hoboken & Patterson Street Railway Co. (N. J.), 64 Atl. Rep. 119. June 18, 1906.

The plaintiff, a lineman employed by a trolley company, was repairing trolley wires from the top of a wagon used by the company for such work. With him on the wagon were the foreman, driver and a helper. After connecting a span wire to the trolley, and in order to connect the other end with a pole which stood on the sidewalk, the foreman directed the driver to turn the wagon to get up to the pole. The driver making too sharp a turn, the wagon was overturned, and the plaintiff was thrown into the street and injured. The court of errors and appeals of New Jersey holds that, the sharp turn being the cause of the accident and both foreman and driver being fellow servants of the plaintiff, there was no error in ordering a nonsuit.

Liability for Injury from Unfinished Track Where Commissioners Have Authorized Running of Cars and a Horse Is Frightened By Car.

Haynes v. Waterville & Oakland Street Railway (Me.), 64 Atl. Rep. 614. Mar. 30, 1906.

That a street railroad company was authorized by the railroad commissioners to run cars before its track was finished and put in proper condition, the supreme judicial court of Maine holds does not exempt the company from liability for injuries resulting from the imperfect condition of the track. And when it appears that a horse frightened by an approaching street car would nevertheless have caused no injury but for the imperfect, unfinished condition of the railroad track, and hence that such condition of the track was a contributing cause of an injury done by the frightened horse, the street railroad company is liable for such injury even though there was no fault in the management of the car.

Motive or Faith of Passenger No Defense to Action for Penalty for Refusal of Transfer—Who Entitled to Transfer and When.

Fitzmartin v. New York City Railway Co. (N. Y. Sup.), 99 N. Y. Supp. 765. June 20, 1906.

It was clearly established in this case, the appellate term of the supreme court of New York says, that the plaintiff desired to make a continuous journey from the point she embarked at to a point on the line she sought to be transferred to, and that, though she refused the transfer, she completed her journey to her point of destination, paying an additional fare to accomplish her trip. It mattered not that she may have said during her examination on the trial of the issues, and it might even be accepted as having been established as a fact, that one of her reasons in taking the ride was to "enforce justice" by collecting the penalty, or that she knew she would be refused a transfer, or that she had other and many similar actions pending, if she was within the statute a passenger, having paid her fare and desiring to make a continuous ride from a given point on one line to a destination that marked a point on another line intersecting with the first, and both wholly within the limits of any one incorporated village or city and controlled, operated, and managed by the same corporation. She was entitled to a transfer on demand at any time before the transfer point was reached.

It might well be, if the defendant persisted in refusing these transfers, that some people either of their own thought or prompted thereto by others, would frame journeys, where the motive and faith might be very questionable, and the result might lead to multiplicity of suits, and courts would well like to make other dispositions of such cases, where their plain duty compelled; but the answer to all this was that the defendant had a quick and efficacious remedy in its own hands to apply, and that was to perform the unquestioned duty that the statute exacted, to wit, the giving of the transfers asked. The statute was evidently enacted, not for the purpose of compensating the passengers for any damage wrought in the refusal to transfer, but rather to inflict a punishment for violation of its terms in order to compel respect for the mandates of the law-making power, and cause it to prove a burdensome experience to indulge in persistent and unjustifiable disregard of its demands. Therefore, the question of motive or faith of the passenger was not available as a defense. Of course, this reasoning and conclusion were based upon the condition of facts revealed by the record in this case, which, in the court's judgment, clearly presented a situation where the right to a transfer was vested in the passenger by the express terms of the statute, a right which the defendant by its refusal violated.

Construction of Reserved Right to Grant Common Use of Street to Later Company—Superimposing Tracks of one Company on those of Another is Taking of Property.

Commonwealth ex rel. Philadelphia Bristol & Trenton Street Railway Co. v. Bond (Pa.), 63 Atl. Rep. 741. Mar. 5, 1906.

What is hereinafter called the later company was by ordinance granted a right by the borough of Morrisonville to construct a track and operate a railway along, over and upon Bridge street for the distance of one block. At the time of the passage of the ordinance an older street railway company had in operation a line on Bridge street by rights acquired under a prior ordinance. The borough had imposed upon the older street railway corporation as a limitation of its grant the condition that it should only occupy Bridge street subject to the right of the borough at any subsequent time to grant to another street railway company the use of said street in common with it. Under this condition and reservation of rights in the prior ordinance it was clearly within the power of the borough, the supreme court of Pennsylvania says, to subsequently grant the right claimed by the later company in the common use of the street.

These grants, the court goes on to say, were made with the express condition imposed that the companies "shall be subject to such reasonable legislation in regard to the construction, maintenance and operation of their street railway as shall from time to time hereafter be ordained and enacted by the said burgess and town council." The borough under its authority to reasonably regulate the construction, maintenance and operation of the later company in the use of the street, required that its line be located in such manner as to straddle the tracks of the older corporation. The street had sufficient width to permit of the construction of both tracks thereon without interfering with each other, but for its own purposes the borough thought proper to compel the construction of the track of the later company so as to occupy part of the track of the older company. The right to do this particular thing was claimed by the borough under the phrase "common use of the street" contained in the ordinance.

When the older corporation accepted the ordinance under which its tracks were constructed with the reservation of the "common use" of the street to a later company it did not thereby agree to give the "common use" of its tracks over the street, but in effect waived its right to the exclusive use of the street. "Common use" of the street did not mean "common use" of its tracks. To superimpose on the tracks of the older company the whole or any part of the tracks of a later company, was the taking of property of the older company. There was no distinction in principle between the taking of the whole of the tracks of the older for the use of the later company and the taking of part of the tracks.

The later company under its ordinance was entitled to construct and maintain its tracks on Bridge street alongside of and parallel with the line of the older company without in any way interfering with it.

Liability for Injury from Crowd Rushing for Cars at Amusement Park Owned by Company—Implication that Company Would Afford Reasonably Safe Guards from Danger on Its Ground and Reasonable Facilities for Returning Home—Questions of Negligence and Contributory Negligence for Jury.

Cousineau v. Muskegon Traction & Lighting Co. (Mich.), 108 N. W. Rep. 720. July 23, 1906.

The plaintiff, a girl about 16 years old, having gone, on July 4, to an amusement park owned by the defendant, where, it was claimed, there were between 7,000 and 8,000 people, and, after the theater there was over, soon after 10 o'clock, having taken a position about three feet from the overcrowded platform at which cars generally stopped, and six feet from the track, to wait for a car, was caught in a rush made by the crowd for two cars, thrown down, going between the motor and trailer, and injured. Was the company negligent in not making adequate provision by the way of railings, barriers and policemen to protect the persons who had accepted the invitation to come to the amusement park, against the dangers incident to such a great crowd? Secondly, was the plaintiff guilty of such contributory negligence that she could not recover damages?

On the second question, the defendant contended that when the plaintiff voluntarily joined the crowd near the platform, edging her way through it to the front ranks near the track, knowing the extent of the crowd, the facilities of the defendant to transport them, the open condition of the track, and the expected approach and frequent passage of cars thereon, she assumed all risks involved in the taking of such position, using the term "assumed risk" in its broad and general sense; that such conduct constituted contributory negligence precluding a recovery. But the supreme court of Michigan says that no authorities directly in point were cited in support of this proposition.

It should be borne in mind, the court says, that this amusement park was several miles from the homes of the people who were in attendance there. It was not owned by the public, but was under the control of the defendant. The people who were there came as patrons of the company, and by its invitation, and for its profit. The crowd was made up of individuals. Before it could get smaller some of them must go away. Most of them must go by the same means which brought them. Were all of the first to go guilty of contributory negligence, and only the late goers free from it? No one knew better than the defendant the number of persons it had brought to the park. In taking them there it was a fair implication it would afford them reasonably safe guards from danger while on its ground, and reasonable facilities for returning home. No individual could get upon a car without getting into the vicinity of where it stopped. There was no testimony indicating that the plaintiff attempted to board a moving car. Her testimony was that she did not. The court does not think that it can be said as a matter of law that because of what the plaintiff did, she was guilty of contributory negligence. At most, it would present a question for the jury.

Returning to the first question, was the defendant guilty of negligence? It knew, the court says, what its facilities were for taking care of a crowd. It knew its facilities for handling them. It invited the people who constituted the crowd to come. In the exercise of ordinary care it would know, and doubtless did know, approximately the size of the crowd. It also knew that many of its members would be eager to return home after a period of time had elapsed. The precise point involved here, so far as the court knows, has not been decided, but there are authorities which afford some light in relation to the principle involved. The court cites Bregee v. Powers, 80 Mich. 172, 45 N. W. 130, which quotes with approval from Cooley on Torts, 606; Sheldon v. Railroad Company, 59 Mich. 172, 26 N. W. 507; Taylor v. Railroad Company (C. C.), 50 Fed. 755; Railroad Company v. Treat, 75 Ill. App. 322; McGearty v. Manhattan Ry. Co. (Sup.), 43 N. Y. Supp. 1086. See, also, it says, Dawson v. Trustees (Sup.), 52 N. Y. Supp. 133; Lehr v. R. R. Co., 118 N. Y. 556, 23 N. E. 889. The reasoning of these authorities, the court adds, seems to be without flaw, and applied to the facts of this case would require both questions discussed herein to be submitted to the jury. So, a verdict having been directed for the defendant, a new trial was ordered.

Another Law Providing for Separation of Races on Street Cars is Held Constitutional—Exception of Nurses—Empowering Conductors to Change Divisions—Power of Company to Make Reasonable Rules and Regulations—No One Has Right to Particular Seat—Passenger Must Conform to Reasonable Rules and Laws.

Morrison v. State (Tenn.), 95 S. W. Rep. 494. Aug. 1, 1906.

The supreme court of Tennessee holds that the act of the general assembly of that state passed April 4, 1905, to promote the comfort of public travel by providing for and securing the separation of white and colored passengers on street cars does not conflict with any principle or rule of the organic law, and is a reasonable and proper police regulation. It says, among other things, that the propriety and necessity for the separation of the white and colored races in Tennessee and other states, where the two races are something like equally divided in numbers, for the material benefit of both of them, is now conceded by all persons conversant with the conditions existing in these states. It violates the rights of no one. It deprives no one of any privileges or immunities to which they are entitled by virtue of any law. It does not discriminate against either race, but applies to both with equal force and effect. Both are subjected to the same restraints, and afforded equal privileges and accommodations.

The classification of the proviso of the statute excepting from its operation nurses attending children or other helpless persons of the other race is a natural and reasonable one, well supported by the necessities of life and the instincts of humanity. It applies to both races, and discriminates against no one in like situation.

The contention is obviously sound, that the provision authorizing the conductors in charge to change the line of division in cars, and to assign seats to passengers in accordance with such change, is an unlawful delegation of the police power to the agents of the street car company. The statute does not create or fill an office, and in no other way could it be carried into effect. The provision is intended to meet emergencies and contribute to the convenience of the public. The statute is obligatory upon the company operating the cars as much as it is upon persons patronizing them, and in no other way could it comply with its provisions.

The company had the power by the common law to make reasonable rules and regulations for the conduct of its cars and the public while upon them, and to assign them to particular places, and the statute confers no new powers upon it, but requires it to exercise one already existing in order to carry the new regulation into effect.

No one has a right to any particular seat in a conveyance. When a passenger proposes to take passage in a public conveyance, he does so subject to the laws, ordinances and reasonable police regulations made by the authorities of that jurisdiction for the government of both the carrier and the passenger, and those made by the owner of the conveyance for its orderly conduct, and he must conform to such rules and laws.

DOCTRINE OF SAFE PLACE APPLIED WHERE LINEMAN WAS INJURED BY BREAKING OF DEFECTIVE POLE SET TWO YEARS BEFORE BY LINEMEN NOT ACCOUNTED FELLOW SERVANTS—DUTY AS TO INSPECTION OF POLES AND EFFECT OF SAME ON DIFFERENT LINEMEN—WHETHER NEGLIGENCE TO ASSUME POLE WILL STAND STRAIN QUESTION FOR JURY.

Livingway v. Houghton County Street Railway Co. (Mich.), 108 N. W. Rep. 662. July 23, 1906.

The plaintiff, while a lineman engaged in putting in a guy wire at the top of a pole, when a feed wire was also being strung, about two years after the construction of the road, was injured by the breaking and falling of the pole, which was originally defective. The case was submitted to the jury upon the theory that it was the duty of the defendant company, in the first instance, to provide a reasonably safe pole for the plaintiff's work as a lineman, and that liability would ensue from the failure to discharge such duty. The supreme court of Michigan says that it seems clear to it that the trial judge did not err in instructing the jury that the doctrine of safe place applied to this case, unless it must be held that the linemen who set the pole were the fellow servants of the plaintiff and that their negligence barred his recovery, but the court is not prepared to go to that extent. There was no evidence that any of the linemen in the defendant's employ at the time of the accident were employed in that capacity at the time the pole was set in the original construction of the road, or that they had any knowledge or means of knowledge of the original defect of the pole, except by taking it out of the ground.

There are satisfactory reasons, the court goes on to say, why the linemen who set the pole should not be permitted to complain of the negligence of their employer in furnishing the pole, since their negligence in using it is equal to his in using it. Neither is there any injustice in holding that, where the company has furnished a proper pole in the first instance and committed its inspection to the linemen, all linemen subsequently employed must protect themselves against defects thereafter developing. But the court thinks it would be unjust to hold that the plaintiff could not complain of the negligence of the defendant, which was the proximate cause of his injury, because of the concurrent negligence of his predecessors, with whom he never was in fact a fellow servant. Neither should it be held that the plaintiff in his contract of employment assumed the risk of the negligence of the original linemen who set the pole, with whom he did not sustain the relation of a co-employe, and whose acts were unknown and unknowable to him. He had a right to assume that the company had put in a proper pole two years before and that the risks which he assumed were such as were incident to the use of such a pole for that length of time.

Cases holding that as the general duty of inspection had been committed to the linemen they could not recover for defects were not decisive of this case. The duty of inspection in the first instance, before providing instrumentalities for the use of employes, is unquestionably a duty pertaining to the employer, and the only reason why the linemen cannot complain of a defective pole is because they are the very men selected by the employer to make this inspection for him. In selecting the poles, they are not performing the duty of a servant, but the duty of a master, and, unquestionably, as to all other servants of the company, the master would be responsible for their negligence in making an improper selection. This being true, it seems to logically follow that only those linemen in the employ of the company at the time of the selection should be held responsible therefor.

If the plaintiff had a right to assume that the pole was originally safe when set two years before the accident, then it was for the jury to say whether he was negligent in assuming that such a pole would stand the strain then put upon it and to be put upon it by starting the team, which was hitched to a rope fastened to the end of the feed wire to draw it along.

CONTRACT WHERE TRANSFERS ARE VOLUNTARILY GIVEN—RIDE ON TRANSFER OR SIXTH TICKET NOT GRATUITOUS—TICKET MERELY EVIDENCE—MISTAKE OF CONDUCTOR—UNREASONABLE CONDITION AS TO CONTROVERSIES—DAMAGES FOR THREAT TO EJECT FROM CAR.

Georgia Railway & Electric Co. v. Baker (Ga.), 54 S. E. Rep. 639. May 18, 1906.

When a company voluntarily and without any compulsion adopts the custom of issuing transfers for the consideration paid the conductor of the first car, it binds itself, the supreme court of Georgia says, by a contract to transport the passenger from the point where he enters the car to a point on any line to which, under the custom of the company, it is usual to issue transfers. In the absence of a custom, the company simply sells to the passenger, for the fare paid, the right to ride between points on the first line. Under a custom of issuing transfers, the offer is made for a stated consideration to transfer the passenger from a point on one line to a point on any other line embraced within the custom. When the passenger pays his fare to the conductor on the first car and requests a transfer, and a transfer is delivered, the offer arising under the custom is accepted, and the contract becomes complete, and the one fare is the consideration for the transportation of the entire journey. The company does not contract merely for the journey on the first line and donate a journey on the second line. Some companies will issue tickets entitling passengers to six rides for 25 cents, when the usual fare paid is 5 cents for each ride. No one would seriously contend that only the first five rides, under such circumstances, were paid for, and the sixth was a mere donation. The company is in the business of selling rides. It may fix the amount which shall be paid for a ride upon either one or more cars. When this amount is paid, the passenger is a purchaser of a ride between the points covered by the contract. This is true, whether, as an original proposition, the passenger could demand a right to ride between these points for the amount paid or not. The position that the transferred passenger is receiving a mere gratuity when he rides upon the second car is untenable.

The contract between the carrier and the passenger is made by the offer held out by the company, although voluntary on its part, to transport the passenger on two lines. The transfer slip is mere evidence of the right to ride upon two lines, and if there has been in fact a contract between the passenger and the agent of the company in charge of the first car, the right to ride upon the second car is complete, although the evidence of the right is defective. The court is aware that this rule may lay the carrier open to imposition in some cases. But, on the other hand, a contrary rule would impose upon the traveling public, and especially those members of it who are inexperienced and uninformed, a serious burden, and one which it is not reasonable that they should be compelled to carry. If a mistake is made by the conductor of the first car in issuing a transfer, and the passenger presents the transfer to the conductor of the second car and gives a reasonable explanation of the mistake to the conductor of the first car, the conductor of the second car must at his peril determine whether the passenger is entitled to ride upon the transfer, notwithstanding it does not upon its face show such right.

A condition on a transfer issued by a street railway company that "the holder, by accepting, agrees that, should any controversy arise as to its validity, holder will pay fare and call at company's office for correction," is unreasonable and void.

A threat by the conductor of the second car to expel a passenger on account of a mistake in the transfer slip is a legal wrong, giving the passenger a right of action against the company, notwithstanding there is nothing insulting in the words or manner of the conductor, further than a mere threat to expel might be deemed an insult. In an action brought to recover damages for a threat to expel a passenger from a street car, who presented a transfer to the conductor which was defective through no fault of the plaintiff, but who, under the facts of the case, was entitled to a ride on the car, the measure of damages is not limited to the amount paid to prevent an expulsion, but general damages may be recovered as for an inexcusable trespass, even though there be no aggravating circumstances connected with the threat of expulsion.

Injury to Person Passing Under Elevated Railway from Particle from Contact-Shoes Getting Into Eye—Right to Go Under Train—Looking Up—Approval and Certificate of Railroad Commissioners No Defense—Duty to Safeguard Public in Construction and Operation of Road—Care Which Must be Exercised to Prevent Sparking or Sparks Injuring People—Failure to Put Up Pan—Questions for Jury.

Woodall v. Boston Elevated Railway Co. (Mass.), 78 N. E. Rep. 446. June 20, 1906. Walsh v. Boston Elevated Railway Co. (Mass.), 78 N. E. Rep. 451. June 21, 1906.

In the first case the supreme judicial court of Massachusetts says that something which the jury found to be a piece of metal from the operation of the contact-shoes on the defendant's elevated railway got into the plaintiff's eye while he was crossing Atlantic avenue between 1 and 2 p. m. on January 23, 1902. He was not bound to wait until there was no train passing overhead, or until the train that was passing had gone along. The surface of the street was and is supposed to be safe for travel notwithstanding the structure and trains overhead.

The time and place of the accident, the character of the particle, the fact that a train was passing overhead, and that sparks fell from trains in ordinary motion would lead naturally to the conclusion that the particle came from the railway. Then, taking all of the circumstances into account it was competent for the jury to find that the particle came from the contact-shoe. The strength and direction of the wind, the exact position of the plaintiff, and the inferences and conclusions to be drawn from these and the other facts in evidence were all for the jury. The plaintiff was not bound to exclude the possibility that the accident might have happened in some other way, but only to satisfy the jury by a fair preponderance of the evidence that it occurred in the manner in which he contended that it did.

Neither the approval of the plans by the railroad commissioners nor their certificate of operation relieves the corporation from liability in case any one who would otherwise have a cause of action is injured by negligence on its part in the construction or operation of the railway. The test is not the approval or certificate of the commissioners. In the absence of anything to exonerate it, the corporation is still bound to exercise reasonable care and diligence in all matters relating to the construction and operation of its railway. And if the approval of the plans by the commissioners and their certificate of operation are not conclusive on the question of the exercise of reasonable care and diligence by the defendant, manifestly the fact that the commissioners had the matter of sparking under investigation and had made no recommendation and taken no action except to cause an investigation to be made cannot be held to be conclusive.

Whether the defendant should, as matter of law, apply to the commissioners for their approval of a pan it was not necessary here to decide. If a pan was reasonably necessary, as the jury found was the case, then it was either the duty of the defendant to apply to the commissioners for their approval, or to proceed to put up one without such approval. It did neither, and was consequently at fault if the evidence warranted the finding that a pan was required, which it seems to the court that the evidence did.

Assuming without deciding that the defendant had done, as it contended that it had, all that, in view of the state of knowledge on the subject when the railway was constructed it could be reasonably required to do to prevent sparking, its whole duty to safeguard the public from the dangers and injuries resulting from sparking was not thereby discharged. If there was any appliance which, in the reasonable operation of its railway, could be used to intercept the sparks or prevent them from falling to the ground and injuring pedestrians and others having occasion to use the street below, it was its duty to avail itself thereof. It was not enough for it to do all that could be reasonably required to prevent sparking (though the court does not mean to intimate that it had done that) and stop there; it was also bound to do all that it reasonably could, if it was impossible to prevent sparking, to see that no one was injured by the sparks. The duty to exercise reasonable care to prevent injury to others extends to all particulars connected with the construction and operation of the railway, and is not entirely discharged even if satisfactorily performed as to some of those particulars. There was evidence that it would have been feasible to construct a trough or pan which would have prevented the falling of sparks upon persons in the street, and that it was known that there was a good deal of trouble from sparking after the road began operation in June, 1901, but nothing was done to remedy it. This warranted a finding of negligence on the part of the defendant.

In the second case, which it says was governed by the first one, the court declares that it could not be said as matter of law that the plaintiff was not in the exercise of due care because he looked up as the train was passing overhead. Whether the defendant did all that could reasonably be required of it to prevent sparks from falling and injuring pedestrians and others using the street beneath was a question under proper instructions for the jury.

Care Required in Crossing Steam Railroad—Negligence and Reasonable Care.

Walsh v. Yonkers Railroad Co. (N. Y. Sup.), 100 N. Y. Supp. 278. July 24, 1906.

There was an exception to the charge of the trial judge in this case that the law required the conductor and motorman to exercise "the highest degree of care and prudence" in making the crossing of a steam railroad. The appellate division, second department, of the supreme court of New York says that it was not necessary to charge this. Negligence is the absence of reasonable care. What is reasonable care depends on the conditions of danger or lack of danger. In some cases very little care suffices to fulfill the rule of reasonable care, while in others the highest degree of care is required to do so. All men understand this perfectly as a matter of fact, and it may well be left to juries. But the charge of the trial judge was not error. If there be any case in which reasonable care calls for the highest degree of care it is the case of a street railroad crossing a steam railroad, especially near a great city where trains are frequent, as was the case here. The court was cited to no case exactly in point, but the foundation of the rule of the highest degree of care is a degree of imminent danger which existed here.

NEWS SECTION

GENERAL NEWS OF THE MONTH

Cleveland Traction Controversy.

The injunction suit of the Cleveland Electric Railway Company against the Municipal Traction Company to prevent the latter from taking possession of Central avenue, Erie street and Quincy street was argued in the United States supreme court on November 12 and 13. The Cleveland Electric appealed from the decision of the federal court in Ohio that the Central avenue, Erie and Quincy street franchises expired in March, 1905, instead of in July, 1914, as claimed by the company, which based its argument on the principle that various extension and consolidation ordinances passed by the council had extended the franchises of the entire system. The low-fare company's argument was in the form of a refutation of the old company's statements. It was agreed to pay no attention to the injunction feature of the case, on which the suit was originally brought, but to go to the root of the matter in order to determine the status of the franchises.

On November 12 the Cleveland city council defeated a resolution ordering a referendum vote to enable the people to vote on the street-railway question.

On November 19 the "blanket injunction" case of the Cleveland Electric company against the Municipal company, in which all the franchise grants to the low-fare company are attacked on the ground that Mayor Johnson, by guaranteeing the stock, became financially interested in the company, was heard in Judge Phillips' court. One of the principal points on which the case rested was as to whether the granting of franchises to the company by the city amounted to a contract within the meaning of the law, which makes it illegal for an officer of the council to be interested in any contract let by the council. Attorneys for the Municipal company claimed that the Cleveland Electric company was not properly in court in a case of public right. Judge Sanders, for the old company, said that Mayor Johnson had taken advantage of his position to try to hoard up public privileges to make use of after he is out of office.

On November 26 Mayor Johnson brought suit in the common pleas court against the Cleveland Electric company asking for $500,000 damages for alleged libelous statements made in one of the "Street Railway Talks" published in the advertising pages of the Cleveland daily papers. He also sued the Chicago Journal for $100,000 damages on account of alleged libelous charges made against him in an editorial.

On December 6 Judge Phillips gave a decision in the "blanket injunction" case overruling the demurrer of the Municipal company and upholding the right of the Cleveland Electric company to attack the validity of the other's franchise grants. In delivering the decision the court took occasion to criticise severely the action of Mayor Johnson in becoming financially interested in the low-fare company, and aiding it to secure franchises.

Progress of the General Settlement Plan in Chicago.

The local transportation committee of the city council has been engaged throughout the month in conferences with the mayor and his traction experts and representatives of the traction companies in the endeavor to reach an agreement on several changes to be made in the draft of the general settlement ordinance submitted by the companies on October 25, a digest of which appeared on page 933 of the Electric Railway Review for November. This ordinance provides for the operation of the street railway lines by the present companies under the indeterminate license plan, with provision for the purchase of the property by the city upon six months' notice.

At a conference on November 8 six of the thirty-four sections of the ordinance were practically agreed upon. The power of the board of consulting engineers was reduced and the clause permitting more expensive construction than that provided for by the specifications was stricken out. The situation was complicated slightly by the visit to the city of Mayor Johnson, of Cleveland, on November 10, and his conference with the mayor and the city's experts, which gave rise to the fear that the city's demand for a provision enabling it to take over the lines to be operated by another licensee under the contract plan was made in order to allow Mr. Johnson to form a holding company for that purpose. The ordinance as drafted provides for purchase by the city only for the purpose of municipal operation, and the companies insist that it would be unfair to them and that it would be impossible to secure the funds necessary for rehabilitation and the construction of a subway if a provision were inserted allowing a holding company to take over the lines.

At a meeting of the committee on November 16 several minor changes in the ordinance were agreed upon. Walter L. Fisher, city traction adviser, suggested a plan for a division of the receipts by which the companies would be guaranteed a return of 5 or 6 per cent on the capital invested, all profits in excess of this to go to the city. At another conference on November 24 an agreement was practically reached, although the details were not given out, by which the right of the city to take over the property through a holding company was reserved, but the companies were protected from the possibility of an outside company taking over the lines simply for its own profit. A section was added to the ordinance whereby the companies agreed to maintain insurance on their properties. Section 19 was altered so that the city may take over the lines on either January 1 or July 1, after giving six months' notice, instead of only on the first of the year. It was agreed that the board of supervising engineers should be selected, one by the city and one by the companies, and the third by the first two, but in the event of a disagreement the third should be selected by the appellate court. Several other minor changes were adopted.

On December 3 the city council passed a resolution instructing the local transportation committee to determine at once the terms of settlement with the traction companies and to report the ordinance to the council before the end of the year.

The negotiations between the city and the companies was brought one step nearer to a settlement on December 10 when the commission appointed by the city last summer to determine the valuation of the street railway lines submitted its report to the local transportation committee. The commission, which consisted of Bion J. Arnold, Mortimer E. Cooley and A. B. Dupont, after six months' work, aided by a large force of assistants, estimated the total value of both the physical and intangible property as follows: Chicago City Railway, without paving, $20,536,510, with paving, $22,369,068; Chicago Union Traction Company, without paving, $26,116,237, with paving, $28,625,714; totals, without paving, $46,652,747, with paving, $50,994,782. In estimating the value of the unexpired franchises, 18 months was taken as the average life of the franchises. The valuations as estimated by the companies in September were $30,436,163 for the Chicago City Railway and $43,119,511 for the Chicago Union Traction Company, or a total of $73,555,674.

Both sides have expressed a willingness to compromise between these figures, although the companies want some allowance made for paving and consider 18 months too low a figure for the life of the unexpired franchises. Also some further discussion will probably be necessary in regard to the north side cable lines, which the commission estimated only in regard to their value for electrical operation. It is believed, however, that an early agreement will be reached and that the ordinance can be submitted to the council in time to let contracts for reconstruction by the first of the year. No opposition is expected in the council.

Railroad Commission Recommends New Roads for New York.

The New York Board of Railroad Commissioners met at New York on November 20 and discussed various problems in regard to the traffic conditions in Greater New York. The recommendations of the board are embodied in the minutes of the meeting. The report contains the following statement:

"All of the available street car facilities of Greater New York, surface and elevated, are inadequate for reasonable comfort and rapid transportation of the people at the time when they most need to be transported. These intolerable local traffic conditions today are due to the unexampled business activity of the whole country, coming down directly upon the stagnant, lethargic attitude of the municipal authorities for more than 20 years past. The added capacity of the new underground railway will be fully lost sight of and neutralized by the growth of traffic within probably three years after it is opened for business. It is the judgment of the board that at least two new lines of underground railway wholly in Manhattan and the Bronx, and three new bridges or tunnels between Manhattan and the Boroughs of Brooklyn or Queens, should be begun at once. Unless some comprehensive work along these lines is forthwith undertaken and carried to completion with dispatch, the city will find itself beset by stagnated traffic difficulties and dangers which will completely overshadow the hard conditions which today are regarded as intolerable."

After repeating various suggestions which have been previously made by the board and citing figures showing the enormous number of passengers carried over the various routes the board makes the following recommendations:

The connection of the Williamsburg and Brooklyn bridges by an elevated structure.

The construction of some form of loops for surface cars at the New York terminus of the Williamsburg bridge.

The elevation of the surface tracks over Sands street to and from the Brooklyn end of the Brooklyn bridge.

The connection of the Fulton and the Washington street tracks at or near Tillary street, in the Borough of Brooklyn.

The extension of the police traffic regulations, which have been curtailed.

The immediate construction and utilization of tracks through Livingston street, in the Borough of Brooklyn.

The third-tracking of the Second and Third avenue tracks of the Manhattan Railway.

Conference Between Ohio Commission and Traction Officials.

An informal conference between the executive heads of Ohio interurban railway systems and the Ohio railroad commission was held at Columbus on December 4 and many subjects relative to the operation of the interurban roads and their compliance with the Ohio railway law were discussed. The commission sought information regarding the operation of the roads and the officials present asked many questions relative to their obligations under the new law.

One of the most important questions under consideration was that pertaining to the precaution taken by electric roads at steam road crossings. The officials of all the roads said they had stringent rules requiring a full stop on approaching a steam road crossing. Some of the rules require this stop to be made 100 feet away from the crossing, while others allow their cars to run up to within 20 feet of the crossing. During this discussion L. C. Bradley, general superintendent of the Scioto Valley Traction Company, entered an emphatic complaint against the attitude of the steam roads relative to these crossings. He said that the greatest hazard in the operation of electric roads was the steam road crossing, because the steam roads pay no attention to these crossings and take no precaution to avoid accidents. F. W. Adams, of the Toledo Fostoria & Findlay Electric Railway, also complained of this attitude of the steam roads. He said that his road carried an average of 2,000 passengers a day, which is more than any of the steam roads that his line crosses carries, yet the steam roads have no regard for the safety of his passengers and his company is compelled to take all of the precaution. Mr. O. P. Gothlin, member of the commission, said there was no law compelling steam roads to recognize an electric line crossing, but he suggested that such a law should be enacted. It developed in the discussion that most of the interurban roads of the state in order to secure crossing rights had entered into contracts with the steam roads that the latters' lines should at all times be kept clear, and relieving them of all responsibility.

The commission asked numerous questions regarding the rules governing the operation of the cars of the various companies, and it developed that practically all of the electric roads of the state operated as far as possible under steam road rules. Norman McD. Crawford, vice-president in charge of operation of the Indiana Columbus & Eastern Traction Company, said that his company was at present preparing a standard code of rules which they expected to put into effect on all of the lines of the Schoepf syndicate. F. D. Carpenter, of the Western Ohio Railway, said that his company expected to operate under the general code of rules adopted by the American Railway Association. The commission was asked if it expected to formulate a code of rules for the operation of the electric lines and the members said they did not, but that they would endorse any code of rules that met the requirements of the law as to safety for passengers and efficiency of service. The methods of training and examining applicants for positions as motormen and the methods of delivering orders relative to the movement of cars were explained. The telephone is used by all the roads in delivering their orders, which are taken by the motorman, written down and read back to the dispatcher for verification. A copy is then given the conductor, who is held jointly responsible with the motorman for the execution of the order.

Mr. Adams, of the Toledo Fostoria & Findlay, asked if the commission had any instructions to give relative to the issuance of free transportation. In answer to this Commissioner Hughes read Section 8 of the Wertz law which tells to whom free transportation may be given by the railroads of the state. The question was raised whether the law prevented the issuance of passes to any person, as this section does not state that free transportation is not to be given to anyone else not designated in the section, but the commission held that this was covered in another section which prevents the granting of any discriminatory rates or favors to any person or persons.

Commissioner Gothlin read the law requiring suitable station buildings at all regular stops and asked the interurban officials what they expected to do in this regard. General Manager George Whysall, of the Columbus Delaware & Marion Electric Railway, said that if this section were applied, a great many stops that are now made would have to be eliminated. He said that shelter houses were being put up by his company at nearly all of their stops, but he did not think that the interurbans, on account of the nature of the service they furnish, should be held to that law. The commission has withheld its ruling on that point.

J. B. Foraker, Jr., vice-president of the Indiana Columbus & Eastern, said his company proposed to erect suitable stations in all of the cities and towns through which they pass. In cities the size of Columbus he said the company expected to erect combination stations and office buildings that would cost practically $1,000,000 each.

The traction officials attending the meeting were: J. B. Foraker, Jr., Norman McD. Crawford, A. F. Schoepf, W. S. Whitney and A. W. Jordan, of the Indiana Columbus & Eastern; Charles F. Smith, Cleveland Painesville & Eastern; L. C. Bradley, Scioto Valley Traction Company; George Whysall, Columbus Delaware & Marion; F. W. Adams, Toledo Fostoria & Findlay; F. J. Stout and F. W. Coen, Lake Shore Electric; C. W. Kamp, Tiffin Fostoria & Eastern; R. J. Wells, Dayton & Union; F. D. Carpenter and C. C. Collins, Western Ohio; C. M. Paxton, Dayton & Troy; Fred J. Green, Springfield Troy & Piqua; and L. P. Stephens, Columbus New Albany & Johnstown.

Reading to Use Electricity.—It is reported that the engineers of the Philadelphia & Reading Railway are working on plans for the operation of trains between the terminal station in Philadelphia and Wayne Junction by electricity, the change to be made simultaneously with the elevation of the tracks.

Coney Island Ten-Cent Fare Case.—Arguments in the case of the state of New York against the Brooklyn Heights Railroad Company were opened in the court of appeals at Albany, N. Y., on December 3. The state denies the right of the company to charge two five-cent fares between New York and Coney Island. The case was appealed from the appellate division of the supreme court.

Electric and Steam Road Joint Tariff.—On December 10 a joint tariff was made effective covering shipments of all class and commodity goods between all points on the Wisconsin Central Railway and all points on the Chicago Milwaukee Electric Railroad. This is the second prorating arrangement with a steam road that the Chicago & Milwaukee Electric has been able to secure and it marks a breaking down of the barriers which the steam roads of the central west have persistently interposed against prorating with an electric line. Another enterprising contract made by the Chicago & Milwaukee is one with the United States Express Company for express service. Two cars devoted exclusively to express and in charge of an agent of the express company make four trips over the entire road in each direction between 3 a. m. and 9 p. m. This service, which began on December 1, is in competition with the service of the American Express Company operating over the Chicago & Northwestern steam line.

New Express Service in Pittsburg.—On December 3 the Pittsburg Railways Company began running two-car express trains from Pittsburg to East Liberty every 10 minutes during the day and every 5 minutes during rush hours, with transfers to all intersecting lines. Tests have been made with four-car trains, two large cars and two trailers, and as soon as sufficient equipment is received four-car trains will be run to East Liberty.

Evening Technical Courses at Columbia University.—Columbia University, of New York, has announced a series of nine evening technical courses to be given at the university this winter beginning on December 3 and lasting 20 weeks. These courses are in engineering physics, elementary mathematics, drafting, strength of materials, machine design, structural design, electrical engineering, steam engineering and special engineering problems.

Proposed Farmers' Mutual Railroad.—A largely attended meeting was held recently at St. Leo, Minn., for the purpose of organizing a farmers' mutual railroad company to build an electric line from northwestern Iowa through the Red river valley in Minnesota to Duluth, to be built and controlled exclusively by farmers. The plan contemplates the organization of 10,000 farmers, each to contribute $25 per year for a number of years for the construction of the road.

Electrical Trades' Directory and Handbook.—"The Electrician," Salisbury Court, Fleet street, London, E. C., announces the preparation of the twenty-fifth edition of the "Big Blue Book," which will be ready January, 1907. This will contain the usual list of British, colonial and foreign engineers and manufacturers, technical and commercial tables and other useful data, together with an illustrated biographical section. This is one of the most useful electrical directories published and will be corrected up to January, 1907.

Cornell University Register.—The annual Register of Cornell University, just issued, is a book of 645 pages and contains the usual large amount of information in regard to organization and instruction, with a description of the various courses offered, of which several new ones have been added. The faculty now comprises 521 members and the total number of students enrolled in the different courses is 3,452, of which 425 are in the College of Civil Engineering and 1,096 in the Sibley College of Mechanical Engineering.

New York Roads Adopt Mileage Books.—Several of the New York electric railway companies have entered into an agreement to adopt the mileage-book system on the interurban lines. The books contain $12 worth of tickets and will be sold for $10. The tickets will not be good on city lines and the conductor will not detach less than 10 cents' worth at one time. The companies included in the agreement are the Rochester Syracuse & Eastern Railway, the Rochester & Sodus Bay Railway, the Syracuse Rapid Transit Company, the Auburn & Syracuse Electric Railway, the Fonda Johnstown & Gloversville Railway, the Schenectady Railway, the Utica & Mohawk Valley Railway, and the Elmira Water Light & Railway Company.

Aurora Elgin & Chicago Express Service.—The Aurora Elgin & Chicago Railroad, which connects Chicago, Wheaton, Elgin, Aurora and intervening towns, is making a strong effort to increase its express business. The company's cars enter Chicago from Fifty-second avenue over the tracks of the Metropolitan West Side Elevated Railway. As the city council recently refused to pass an ordinance permitting it to carry express on the elevated line the company has established a down-town express station at Jackson and Franklin streets, and will carry the express packages from there to Fifty-second avenue in large freight automobiles. Beginning on December 1 two express trains each way are operated over the lines daily.

Passenger Prorating Agreement Between New York Central and Trolley Roads.—The New York Central & Hudson River Railroad has recently entered into a prorating agreement with two electric roads, the Utica & Mohawk Valley Railway, of Utica, N. Y., and the Rochester & Eastern Rapid Railway, of Rochester, N. Y., to issue tickets good for a through passage over the steam road to any point on the connecting electric line. Both of the companies are controlled by New York Central interests. The Rochester & Eastern connects with the Central at Rochester and runs to Pittsford, Canandaigua and Geneva, 44 miles. The Utica & Mohawk Valley parallels the New York Central from Rome to Little Falls, operating 116 miles of road.

Reconstruction Work on San Francisco Car Lines.—Of the 2,500 city blocks of street car lines in the system of the United Railroads of San Francisco, which were put completely out of commission by the earthquake and conflagration of April 18, 19 and 20, the company now has 2,150 blocks restored to regular operation, a large number of them being new trolley lines, converted from what were, up to the time of the fire, slow-running cable systems. The work of reconstruction has proceeded night and day and a short time ago nearly 3,000 laborers and 160 teams were at work on the new tracks, supplemented by many trolley work cars. On November 22 the Polk, Larkin and Tenth street cross-town line was completed, giving the burned district a new route to relieve the congestion of the Fillmore line. The Powell street cable line is expected to be completed by December 15, followed soon by the completion of the Hayes street line, and by Christmas the Haight street cable line will be converted into an operating trolley line. Orders have been given to add new laborers as fast as they can be hired, and Mr. Thornton Mulally, assistant to the president, states that the entire system will be restored for the operation of regular cars. The car manufacturers are doing their best to deliver the new cars as fast as possible and it is promised that, beginning on January 1, the new cars will arrive at the rate of ten a week.

Rate-Cutting in Iowa.—A rate war between the steam and electric roads in Iowa was recently inaugurated when the Minneapolis & St. Louis Railway (steam), which has had a one-way rate of $1.05 between Des Moines and Perry, made a round-trip rate between those points of $1.10, to meet the rate of the Interurban Railway, of Des Moines, which has just opened its line to Perry. The Chicago Rock Island & Pacific Railway has taken a similar action in reducing its rate between Cedar Rapids and Iowa City, to meet the rate of the Cedar Rapids & Iowa City Railway & Light Company. The interurban roads, it is said, are preparing to contest the action of the steam roads on the ground of discrimination in rates between localities.

To Meet Municipal Ownership Light Rates. In order to prove that public utilities cannot be conducted as economically by municipalities as by private corporations, President J. I. Beggs, of the Milwaukee Electric Railway & Light Company, has submitted to the Milwaukee city council an offer to furnish the city with electric light at the prices paid in Detroit, which is conceded to have one of the best municipal lighting plants in the United States. The Milwaukee company has been supplying the city with light for the past year without a contract and now offers to make a 5-year contract at $65 per lamp or less at any time when Detroit produces light at a less rate; that is, he will meet the Detroit rate at all times plus the difference in the price of coal in the two cities.

Work of the Public Ownership Commission of the National Civic Federation.—The public ownership commission of the National Civic Federation, after an exhaustive investigation of public ownership, both in Europe and America, is understood to be unanimously opposed to public ownership on the ground that it is unscientific, wasteful and morally undesirable. The report of the commission, which is composed of 100 prominent men, is expected to be forthcoming some time in January. The commission appointed 21 of its members a committee on investigation to examine the conditions and results of public as contrasted with private ownership and operation of public utilities in this country and abroad. Fifteen members spent four months abroad examining conditions in England and are now completing their work in this country .

Sleeping Cars on the Illinois Traction System.—The Illinois Traction Company has recently purchased two parlor sleeping cars, built by the Holland Sleeping Car Company, which will be operated between Decatur, Springfield and St. Louis. One car will leave Decatur at 10 p. m., arriving at Springfield at 11:30 p. m. and at St. Louis at 7:30 a. m., while the other will leave St. Louis at 12:00 p. m., arriving at Springfield at 6:00 a. m. and at Decatur at 8:00 a. m. The fare will probably be one dollar for a berth in addition to the regular fare. The cars are 56 feet long, weigh about 45 tons, and have sleeping accommodations for 20 passengers. The interior is luxuriously furnished, with all the usual conveniences. Each car is equipped with four 150-hp motors. This is the first attempt in this country to operate sleeping cars on electric roads.

Capacity of Chicago Union Loop to be Increased.—At a conference on December 6 between Mayor Dunne and the presidents of the roads operating over the elevated "Union Loop" plans were discussed for increasing the capacity of the loop in order to relieve the dangerous overcrowding of elevated trains. At present the capacity of the loop will not permit of more trains being run. The conference took the form of a compromise between the city and the railroads and a tentative agreement was reached looking to the following changes, which, however, are to be further discussed by Bion J. Arnold, the city's consulting engineer, and the companies' engineers, before any definite action can be taken.

The loop junctions in Fifth avenue and Lake and Van Buren streets to be double decked, so that trains bound in one direction pass overhead those bound the opposite way.

Through routing ultimately to be established.

Platforms of loop stations to be lengthened.

Universal transfers are to be exchanged between the lines.

The Northwestern to build a stub-end terminal in Dearborn street.

Increased Service in New York.—The New York Board of Railroad Commissioners on November 13 passed a recommendation that the New York City Railway Company cause the service on all its lines operated by electricity in the Borough of Manhattan during the hours from 6:30 to 9:00 a. m. and from 5:00 to 7:00 p. m. to be increased 10 per cent, in view of the constantly increasing travel and the probable further increase during the holiday season. The recommendation took effect on November 26. On the same day the board of aldermen passed a resolution calling upon the rapid transit commission to order the Interborough Rapid Transit Company to provide express service in the Broadway division of the subway between Ninety-sixth and One Hundred and Forty-fifth streets. The company's officers said that the third track in the subway, which was originally intended for express service, was needed for car storage purposes until additional yard facilities have been provided, and that, moreover, under the present conditions the addition of express trains in that section of the subway would be unsafe. On November 16 the rapid transit commission received a report from Chief Engineer Rice that express service was not at present feasible beyond One Hundred and Thirty-seventh street. The commission then adopted a resolution that express trains be run to that point, and on November 19 the company complied by putting on three express trains in the morning and three in the evening.

On November 26 the New York City Railway added 50 cars on the surface lines. The officers state that more cannot be added without causing further congestion, but experiments are being conducted with two-car trains.

Proposed Electrification of Local Roads of the Southern Pacific Company.—General Manager E. E. Calvin, of the Southern Pacific Company, has announced that the two steam roads running from Alameda and Oakland to the Alameda Mole are to be converted into electric roads. The plans are already completed, and the work of reconstruction will be begun as soon as the necessary material can be obtained. The cars are to be of the overhead trolley type and will each have a seating capacity of 84. The plans include the erection of a large power house at Alameda Point, near the present location of the roundhouse; $1,126,700 have been voted for these improvements. The Southern Pacific Company is also planning to change to electric traction the Encinal avenue line and the Lincoln avenue line, which also run through Alameda. The latter is to continue on to Melrose over the greater part of the local line which crosses the Fruitville avenue bridge.

Canadian Street Railway Association.—The semi-annual meeting of the Canadian Street Railway Association was held at the King Edward hotel, Toronto, on December 7 and 8. The following papers were read: "The Power House," by J. C. Rothery, general manager East Liverpool Traction & Light Company; "Shop Practice," by Walter McCrae, mechanical superintendent Toronto Railway; "History of Electric Traction," by R. Clark, assistant controller Toronto Railway. A general discussion was held on the following subjects: 1. Track Construction and Repair, introduced by A. M. Grantham, chief engineer Toronto Railway. 2. Standardization of Equipment, C. B. King, general manager London Street Railway. 3. Discipline, J. E. Hutchinson, manager Ottawa Electric Railway. 4. Impressions of the Columbus Meeting, A. H. Royce, president Toronto Suburban Railway. 5. Freight and Mail Delivery, E. F. Seixas, manager Niagara Ste. Catharines & Toronto Railway.

The Toronto Railway Company entertained the representatives present at a formal dinnner at the King Edward hotel on December 7.

Progress of Bridge Loop Plans in New York.—In view of the defeat of the proposed elevated loop connecting the Manhattan ends of the Brooklyn and Williamsburg bridges those interested in securing better traffic facilities for Brooklyn by relieving the congestion at the bridges are now endeavoring to carry out a temporary plan of relief, which includes the construction of an elevated terminal at the Manhattan end of the Williamsburg bridge, to be connected with the elevated lines of the Brooklyn Rapid Transit system, and the extension of the terminal facilities of the Manhattan end of the Brooklyn bridge by establishing a small loop around the triangle now occupied by the Staats-Zeitung building. The board of estimate and apportionment on November 24 authorized the purchase by December 24 of the Staats-Zeitung building and enough land adjacent to it to permit the construction of the loop. The building was ordered to be razed within five months and construction of the terminal is to begin in 90 days.

On November 22 delegates from about 40 civic organizations in Brooklyn met and formed an organization to be known as the "Citizens' Central Committee of the Borough of Brooklyn," of which the chief object is to bring about the erection of a temporary elevated loop to connect the Brooklyn and Williamsburg bridges and the general object to secure transit relief for Brooklyn. A committee on legislation was appointed to further the purposes of the organization.

Co-Operative Insurance Meeting.—A meeting of representatives of a number of the leading street and interurban railway and electric lighting companies was held at the office of the American Street and Interurban Railway Association, 60 Wall Street, New York, on December 7th, to consider the report of the "Insurance" committee of the association, which was presented at the Columbus convention, and the plans of insurance recommended by the committee. The following companies were represented: Cleveland Electric Railway, Rochester Railway, Syracuse Rapid Transit Company, Utica & Mohawk Valley Railway, Schenectady Railway, Rochester & Eastern Rapid Railway, Rome City Railway, Oneida Railway, Northern Ohio Traction & Light Company, Toledo Railway & Light Company, Canton-Akron Railway and others, Detroit United Railway and others, Bangor Railway & Light Company, East St. Louis & Suburban Railway, Alton Granite & St. Louis Traction Company, Grand Rapids Railway, St. Joseph Railway Light Heat & Power Company and others, Columbus Railway & Light Company, Lake Shore Electric Railway, Cleveland & Southwestern Traction Company, Cleveland Painesville & Eastern Railway, Brooklyn Rapid Transit Company, Detroit Edison Company, Cleveland Electric Illuminating Company, Interstate Railways Company, Philadelphia, Pa. In addition to these companies a number of others of equal importance have signified their intention to co-operate in the movement, but were unable, for various reasons, to send representatives to the meeting. It was the opinion of all the railway and lighting men present that their companies could successfully carry their own risk through their own insurance organizations. It was decided that, sufficient capital having been subscribed to the American Railway Insurance Company to warrant the writing of insurance on traction and lighting properties, the organization be completed and a resolution to that effect was adopted A meeting of the subscribers to the stock will be called at once, and directors and officers will be elected. The subscribers expect to be ready to write policies by January 1 or soon thereafter.

Jurisdiction of Wisconsin Railroad Commission Over City Lines.—The Wisconsin railroad commission wishes a further definition of its powers over street railways. The annual report to the governor contains the following statement: "The jurisdiction of the commission over street railways should be either increased or diminished. Under the construction placed upon the law by the attorney general and by the commission it confers jurisdiction upon the commission to regulate any street railway company whose lines pass beyond the limits of the city in which it is operating. This right of regulation extends to the urban business of the company as well as to the business of the company outside of the limits of the city. As a result the commission appears to have a right to regulate the entire business of a street railway company where any of its lines extend beyond the city limits, but it has no right to regulate the business of a street railway company whose lines are entirely within the limits of the city in which it is operating. It would appear to the commission that it should either have power to regulate the urban business of all street railway companies operating in the state or that such power should not extend to any of them."

Milwaukee Demands Two-Cent Fare.—The city of Milwaukee, Wis., through City Attorney Kelly, on November 30 filed with the Wisconsin railroad commission a bill of complaint against The Milwaukee Electric Railway & Light Company, asking that the company be ordered to remedy its service in several particulars. Among the complaints made are the following: That a five-cent fare is excessive; that the use of hand brakes instead of air-brakes is a constant source of danger and discomfort to passengers; that freight trains are run through the streets without authority, blocking crossings and endangering lives; that too few cars are provided during the morning. The statement regarding fare is as follows:

"That said charge of 5 cents for a single cash fare and said charge of $1 for packages of 25 tickets, and said charge of 25 cents for a package of six tickets good for one continuous ride, with the privilege of one transfer within the city limits, is exorbitant and excessive, and more than said fare is reasonably worth, and your complainant alleges on information and belief that a reasonable return upon the investment made by said road in said city, aside from the expenses of management and operation, can be made for a much smaller fare than is now charged by said railway company, and that a fair rate of compensation for the service performed by said railway company would be a charge of not to exceed 2 cents for one continuous ride, with the privilege of one transfer within the city limits, tickets to be sold in packages for the convenience of the company and the traveling public."

Before the commission can take any action in this matter it must be determined whether it has jurisdiction over city lines.

Brooklyn Bridge Overtaxed.—Vice-President John F. Calderwood, of the Brooklyn Rapid Transit Company, recently gave out a statement showing the enormous amount of traffic over the Brooklyn bridge and declaring that it is the most vexatious transportation problem in the world. Mr. Calderwood said:

"We have reached the limit of capacity in the Brooklyn bridge operation, and I venture the assertion that there is no transportation problem in the world that presents so many difficulties as the present operation on the Brooklyn bridge. Conditions are continually growing worse instead of better. We are now operating five-car bridge trains during the rush hours of the night and morning on a 60-second interval. Sometimes it will run as low as 55 seconds, which means 65 five-car trains, or 325 elevated cars, an hour. Until within the last few weeks the best operation ever attempted was four-car trains. We are also operating nearly 300 surface cars, which pass around the loop on the Manhattan end of the bridge every hour. We are also operating during the rush hours about 90 six-car elevated trains in and around the Brooklyn terminal of the Brooklyn bridge, or about 540 cars an hour. This is also the limit of this terminal operation under present conditions. This, of course, governs the number of trains that can be operated on our elevated lines reaching the Brooklyn bridge. We can have no improvement in this condition until we can operate through elevated trains across the Brooklyn bridge. This would relieve the present tension at this end of the bridge and enable us to put more trains on our elevated lines leading to the Brooklyn bridge. So far as the Brooklyn Rapid Transit is concerned, every one connected with the operating department is straining every point during the 24 hours to do the best he can in connection with this operation, fully realizing not only its importance but its danger. While the operating department is in no manner responsible for present conditions, you can rest assured that we are keeping the records of this operation in such shape that in the event of a calamity not only the men who are in direct connection with this operation will share its responsibility, but all others who are in any way responsible for the present conditions."

PERSONAL MENTION

Mr. M. V. Whitton, of Canandaigua, N. Y., has resigned as auditor of the Rochester & Eastern Rapid Railway and the Ontario Light & Traction Company.

Mr. James Rinehart has been appointed to the newly created position of purchasing agent of the East Liverpool Traction & Light Company, of East Liverpool, O.

Mr. H. E. Farrington, superintendent of car repairs of the Boston & Northern Street Railway, has resigned to become master mechanic of the United Railroads of San Francisco.

Mr. F. A. Deverell, secretary of the Indiana Columbus & Eastern Traction Company, has resigned to become auditor of disbursements of the Cincinnati Hamilton & Dayton Railway at Cincinnati, O.

Mr. J. C. Kruss, of St. Louis, Mo., has been appointed chief engineer of the Michigan United Railways, succeeding Mr. F. R. Phillips, resigned to take a position with the Ohio Brass Company, of Mansfield, O.

Mr. George W. Rounds, heretofore superintendent of the Houghton County Street Railway, of Hancock, Mich., has been appointed general superintendent of the Terre Haute, Ind., Traction & Light Company.

Mr. F. L. Morse, who was formerly connected with the Brooklyn Rapid Transit Company, has been appointed superintendent of the Utah Light & Railway Company of Salt Lake City, succeeding Mr. W. P. Read, resigned.

Mr. R. S. McManeny, of Butte, Mont., has been appointed general electrical engineer of the Youngstown & Ohio River Railroad, in charge of the power plant at Leetonia, O., and of the plant now under construction at West Point, O., with headquarters at West Point.

Mr. J. H. Pardee, of Canandaigua, N. Y., general manager of the Rochester & Eastern Rapid Railway and the Ontario Light & Traction Company, has been elected secretary of the Street Railway Association of the state of New York, succeeding Mr. C. B. Fairchild, Jr., resigned.

Mr. William J. Goldthwaite, Jr., until recently superintendent of the Canton-New Philadelphia Railway and the Tuscarawas Traction Company, at New Philadelphia, O., has been appointed superintendent of the Manchester (N. H.) Street Railway, succeeding Mr. W. E. Maloney, resigned.

Mr. W. S. Whitney has been appointed general passenger and freight agent of the Indiana Columbus & Eastern Traction Company, the Cincinnati Northern Traction Company and the Lima & Toledo Traction Company, with office at Columbus, O., succeeding Mr. Walter Hurd, who resigned some time ago.

Mr. L. J. Shlesinger has resigned as superintendent of motive power of the Indiana Union Traction Company, with headquarters at Anderson, Ind., to become manager of a mercantile establishment in Cleveland.

Mr. M. G. Starrett has resigned as chief engineer of the New York City Railway and has been appointed consulting engineer of the company and its allied companies. The office of chief engineer has been abolished. Mr. Starrett entered the service of the New York City Railway in 1896 as assistant chief engineer, and has been chief engineer since 1899.

Mr. F. A. Boutelle, heretofore superintendent of transportation of the Columbus Newark & Zanesville Electric Railway, of Newark, O., on November 15 assumed his duties as superintendent of transportation of the Tacoma Railway & Power Company, Tacoma, Wash. He succeeds Mr. C. J. Franklin, superintendent, who has resigned to take service with another company.

Mr. William C. Sampson, of Anderson, Ind., has resigned as secretary and assistant treasurer of the Indiana Union Traction Company to become connected with the Muncie & Portland Traction Company. Mr. W. H. Forse, heretofore auditor, has been appointed assistant treasurer, to succeed Mr. Sampson, and Mr. Walter Schroyer has been appointed auditor.

Mr. G. G. Crane has resigned as superintendent of construction of the Allis-Chalmers Company, of Milwaukee, Wis., to become superintendent of motive power of the Rockford & Interurban Railway, with headquarters at Rockford, Ill. Mr. Crane was for a number of years master mechanic of the Joliet Plainfield & Aurora Railroad. He assumed his new duties at Rockford on December 1.

Mr. Joseph S. Wells, who was second vice-president of the Utah Light & Railway Company, at Salt Lake City, Utah, prior to the recent reorganization, has been appointed acting general manager, succeeding Mr. R. S. Campbell, resigned. Mr. O. A. Honnold, heretofore electrical engineer, has been appointed chief engineer, at Salt Lake City, and the office of electrical engineer has been abolished.

Mr. R. A. Leussler, secretary of the Omaha & Council Bluffs Street Railway, of Omaha, Neb., has been appointed assistant general manager. Mr. Louis C. Nash has been appointed superintendent of transportation and Mr. William Musgrave, assistant superintendent of transportation. Mr. H. B. Noyes, heretofore electrician and master mechanic, has been appointed chief engineer. Mr. J. J. Gorman has been appointed superintendent of track and roadway; Thomas Wood, master mechanic, and Mr. D. W. Gilbert, superintendent of power stations. The office of general superintendent, formerly held by F. A. Tucker, deceased, has been abolished.

Mr. H. V. Sanger, who was formerly connected with the Wheeling, W. Va., Traction Company, has been appointed superintendent of the railway department of the Benton Harbor-St. Joseph Railway & Light Company, of St. Joseph, Mich.

Mr. Thomas F. Ryan, of New York, has resigned as director of all the railroad companies with which he was associated, including several large traction companies, the Interborough-Metropolitan Company, the New York City Railway, and the Union Elevated Railroad, of Chicago. He will probably be succeeded by his sons. Mr. Ryan will hereafter devote his time to the financial and fiduciary institutions in which he is interested.

General Manager Charles Currie, of the Northern Ohio Traction & Light Company, of Akron, O., has announced the following appointments effective on November 16: W. H. Douglas, general superintendent; G. E. Barber, division superintendent of the lines from Akron to New Philadelphia; D. A. Scanlon, division superintendent of Canton and Massillon city lines; John Freeman, division superintendent of lines from Canal Dover to Uhrichsville; W. E. Ralston, superintendent of motive power; Ed. Garrety, roadmaster.

Mr. R. C. Taylor, for the past three years mechanical engineer of the Brooklyn Rapid Transit Company at Brooklyn, N. Y., was on December 1 appointed superintendent of motive power of the Indiana Union Traction Company at Anderson, Ind., succeeding Mr. L. J. Schlesinger, resigned. Mr. Taylor is 42 years of age, was born at Brechin, Scotland, and was educated at the Science and Art School, London. He has had a long and varied experience as a mechanical engineer, having been for five years master mechanic of the West Superior Iron & Steel Company at West Superior, Wis.; for six years mechanical engineer of the Robinson & Cary Company, of St. Paul, Minn., and for four years master mechanic of the Twin City Rapid Transit Company. In his present position he will have charge of the motive power for the entire system of 319 miles, operating over 260 cars. Mr. Taylor has patented or applied for patents on several railway devices, including an electric block signal system, airbrake apparatus for multiple-unit trains, brake hanger for railway car trucks, multiple-unit control for surface cars, electric heating system for electric cars, and combined electric and hot-water heaters for electric cars.

R. C. Taylor.

Mr. F. A. Healy, auditor of the Atlanta & West Point and the Western of Alabama, has tendered his resignation to take effect on January 1, to accept the position of secretary and treasurer of the Schoepf-McGowan traction syndicate controlling the Cincinnati Northern Traction Company, the Indiana Columbus & Eastern Traction Company, the Lima & Toledo Traction Company, and the Columbus & Lake Michigan Railroad, which is to be converted from a steam into an electric line. Mr. Healy's headquarters will be at Cincinnati, O. Mr. Healy was born at Moline, Ill., on June 12, 1861, and began his railway career in April, 1880, from which date to 1884 he was office boy and clerk on the Atchison Topeka & Santa Fe. He was then for four years assistant chief clerk in the auditor's office of that road, and from July, 1888, to May, 1893, was chief clerk in the auditor's office of the Southern California Railway. In May, 1893, he was appointed auditor and general freight and passenger agent of the Santa Fe Prescott & Phoenix, which position he held until August, 1895. From August to December 1 of the latter year he was engaged as an expert accountant, and on the latter date was appointed general auditor of the South Carolina & Georgia. Subsequently he was auditor of the Augusta Southern and the Ohio River & Charleston and auditor for the receiver of the Ogdensburg & Lake Champlain Railroad. He has been auditor of the Atlanta & West Point and Western of Alabama since December 15, 1899. Mr. Healy is well known as a writer on accounting matters.

Obituary.

F. A. Tucker, superintendent of the Omaha & Council Bluffs Street Railway, Omaha, Neb., died on November 12 at his home in Omaha, aged 58 years. Mr. Tucker has been identified with street railway work since the '70's, helping to build the first cable line in San Francisco.

Richard Emory, manager of the San Jose & Santa Clara Railway and general manager of the Santa Clara Interurban Railroad, of San Jose, Cal., died at his home in San Jose on November 25. He was 37 years of age. Mr. Emory was formerly manager and chief engineer of the Baltimore Consolidated Railway Company any was at one time manager of the Memphis Street Railway.

CONSTRUCTION

TRACK AND ROADWAY.

Altoona Hollidaysburg & Bedford Springs Electric Railway.—The Federal Construction Company, of Pittsburg, has been awarded the contract for the construction of this road and it is expected that the line will be completed from Hollidaysburg to Newry, Pa., by July, 1907.

American Electric Railroad.—An official report states that contracts will be let March 1, 1907, for the first portion of this road, from Des Moines to Greenfield, Ia., 54 miles, which is now being surveyed. The entire plan contemplates a road from Des Moines to Council Bluffs, 134 miles, via Winterset, Greenfield, Fontanelle, Cumberland, Griswold and Carson. The road will serve a rich dairy and stock-raising country and will reach several coal mines. Both freight and passenger service are to be handled. Strang gasoline-electric cars are to be used at first, after which single-phase equipment is to be installed. The officers are: President and chief engineer, C. W. Baker; secretary, C. F. Castleman, treasurer, J. D. Pollard; all of 317 Clapp block, Des Moines, Ia.

Aurora Elgin & Chicago Railroad.—This company is considering plans for an extension from either Maywood or Melrose Park to Hinsdale, Ill.

Bay Counties Electric Railway.—This company has begun the construction of its line from Richardson's Bay to Santa Rosa and Napa, Cal. The right of way has been secured. Richard M. Hotaling, of San Raphael, is one of the promoters.

Brookings & Sioux Falls Railway.—It is stated that contracts will be let about January, 1907, for building this line from Brookings to Flandreau, Egan, Dell Rapids and Sioux Falls, S. D., about 75 miles. Surveys have been made and right of way secured. Isaac A. Smith, of St. Louis, is chief engineer; Neil Stewart, Brookings, S. D., president.

Central Texas Traction Company.—A corps of surveyors under the direction of J. W. Martin is making the third survey for the line between Dallas, Ennis and Waxahachie, Tex.

Charleston & Summerville Electric Railway.—About 150 men have started work at both ends on the grading of this line, which will connect Charleston and Summerville, S. C., 27 miles. Complete contracts for the construction and electrical equipment have been let. D. E. Baxter & Co., of New York, has the general contract for the electrical equipment. The power house, which will be located about nine miles out of Charleston, will be equipped with Snow gas engines and 6,600-volt, single-phase current will be used. The overhead work is of the catenary type. Seventy-pound rails will be laid.

Cleveland Brooklyn & Elyria Railway.—This company, which was incorporated several months ago to build from Cleveland to Elyria, O., via Stonesville Vigil, Columbia and North Eaton, has secured all the necessary right of way and bids are being received for the construction. J. J. Breitinger, Cleveland, is president.

Cleveland & Sharon Electric Railway.—Francis B. Morgan, president, Cleveland, O., writes that this line will extend from Cleveland, O., to Sharon, Pa., 80 miles, of which 42 miles, from Middlefield to Sharon has been surveyed and 38 miles, from Middlefield to Cleveland, is being surveyed. Grading is in progress from Bloomfield to Sharon, 31 miles. Work on the power house and substations will begin March 1, 1907. The Eldenbel Construction Company, of New York, has the contract.

Dallas Interurban Electric Railway.—A contract has been signed by which this road, from Dallas to Greenville, Tex., with several city lines in Dallas, will be built by the American Engineering Company, of Indianapolis, Ind. The contract includes all preliminary work and it is stated that work will begin within two weeks. J. Mercer Carter, of Dallas, is the promoter.

Denver & Southeastern Electric Railway.—This company has been organized at Denver, Colo., to build an electric railway from Platte canyon to Denver, via Englewood, about 16 miles. The Platte Canyon Fuel & Power Company is backing the project and has already graded four miles down the canyon. Plans are being completed for a large power house in the canyon. The officers are: President, George I. Cole; vice-president, C. H. Chase; secretary, I. C. Cockey; treasurer, S. B. Thomas; all of Denver, Colo.

East Liverpool Traction & Light Company.—Westinghouse Church Kerr & Co. has the contract for the engineering work on this company's extension from East Liverpool, O., to Midland Pa., and work will start at once. Work has been started on the extension from Willsville to Toronto, O. J. C. Rothery, general manager, East Liverpool, O.

Fort Dodge Des Moines & Southern Electric Railway.—The grading between Des Moines and Kelley, Ia., has been completed and track is being laid. Grading is now in progress between Kelley and Ames. The officials of the company hope that the line will be ready for operation between Des Moines and Boone by January 1. Homer Loring, of Des Moines, is president.

Fort Wayne & Springfield Railway.—Track has now been laid from the court house in Decatur to that in Fort Wayne, and the road has been ballasted from Decatur north to the sand pits. Rapid progress is being made on the overhead work and it is expected that cars will be running by Christmas. W. H. Fledderjohann, general manager, Decatur, Ind.

Frontier Electric Railway.—The New York railroad commission has granted this company a certificate of necessity for its proposed line from Buffalo to Niagara Falls. The Frontier Electric Railway is a subsidiary company of the International Railway Company, of Buffalo, and will give the latter a four-track road to the falls. The new line will carry freight.

Georgia Railway & Electric Company (Atlanta, Ga.)—This company will build an extension to Buckhead, 4 miles. The East Point line will also be extended to Hapeville and the Decatur line will be extended to Stone Mountain, via Clarkston. These extensions will add 18 miles to the system.

Hamilton & Brantford Electric Railway.—F. H. Dickenson, who has the contract for grading this road, from Ancaster to Brantford, Ont., has also been awarded the contract for tracklaying. About 11 miles of grading has been completed and the rails have been delivered.

Hattiesburg Traction Company.—Work was started on November 29 on the first street railway in Hattiesburg, Miss. Creosoted cross-ties have been distributed along the route and the rails have been delivered. About 9 miles of track are to be laid at once.

Houston Electric Company.—Guy E. Tripp, of Boston, who is vice-president of this company, representing Stone & Webster, of Boston, the owners, has announced that $200,000 has been appropriated for track improvements, new rails, etc., and that construction will begin on the interurban line from Houston to Galveston in the spring. New machinery with a capacity of 1,200 horsepower will be installed in the Houston power house and new cars will be purchased.

Idaho Northern Railroad.—This company is planning to build about 76 miles of road in the Coeur d'Alene mining district, to be operated at first by steam, but later by electric power furnished by the Big Bend Power Company. B. F. O'Neil, of Wallace, president.

Iowa-Missouri Traction & Power Company.—M. C. Picking, Memphis, Mo., a director of this company, writes that contracts are to be let at once for the construction of this road from Fairfield, Ia., to Memphis, Mo., via Keosauqua and Milton, Ia., 52 miles. Harrison Blacklege, president, Keosauqua; J. W. Andrews, chief engineer, Keosauqua.

Indianapolis Crawfordsville & Western Traction Company.—A. E. Reynolds, of Indianapolis, vice-president of this company, which is under construction from Indianapolis to Crawfordsville, Ind., has been appointed general manager. It has been decided to call the road the "Ben-Hur" Route, as Crawfordsville was the home of General Lew Wallace, the author of the novel of that name.

Jackson Ann Arbor & Detroit Railway.—Work has been started on the grading of this line which is to connect Jackson and Detroit, Mich., and 50 teams and 100 men are engaged near Dearborn. Geo. W. Meacham, of Battle Creek, is secretary.

Jonesboro & Nettleton Electric Railway.—W. W. Williams & Co., of Nashville, Tenn., will finance and construct this road, which will connect Jonesboro and Nettleton, Ark. Robert McGill, of Memphis, Tenn., and D. S. Copeland, of Jonesboro, Ark., are interested.

Lake Shore Electric Railway.—This company is considering changing its route through Lorain, O., and establishing a line about a mile farther south from the shore of the lake. This move is stated to be made necessary by the projected improvements at Oak Point. The new route will shorten the line five miles, and by obviating delays at the Erie avenue draw and the draw at Oak Point, together with the shortening of the route, is expected to reduce the running time between Cleveland and Toledo by 30 minutes. By the new plan the road will run over the Avon Beach & Southern to Tenth avenue, thence to Colgate street and southwesterly to a point about half a mile south of Beaver Creek at Oak Point.

Ledrachville & Pennsburg Electric Railway.—This company has been organized at Pennsburg, Pa., to build a road connecting at Ledrachville with the line now under construction from Trooper to Souderton. The new line is to extend from Ledrachville through Sumney town, Greenlane, Red Hill, Pennsburg and East Greenville to Palm. The Schuylkill Valley Traction Company, of Norristown, Pa., is backing the project.

Lima & Toledo Traction Company.—The cars of this company are now in operation from Lima as far north as Leipsic. Heretofore the cars have only been run as far as Ottawa. Construction work is still in progress and it is hoped to have the line in operation to Toledo by May 1.

Louisville New Albany & Corydon Railroad.—McKinley Boyle, president, Corydon, Ind., states that this steam road between Corydon and New Albany is to be electrified as soon as possible and an extension built. Surveyors are now locating the line and the townships of Harrison and Franklin have been asked to vote a 2 per cent subsidy.

Louisville Railway.—This company will build a three-mile extension during the winter from Valley Station to Orell, for which the grading has been completed. Another extension will be built out the Bardstown road to Fern Creek. J. T. Funk, superintendent, Louisville, Ky.

Marion Bluffton & Eastern Traction Company.—This line from Marion to Bluffton, Ind., is expected to be in operation about December 15. The track is all laid and the overhead work is completed. Work on the ballasting is now in progress. Two substations, at Van Buren and Liberty, are nearly completed, as well as a brick car house near Bluffton. R. F. Cummins, Bluffton, superintendent.

Mesaba Traction Company.—The Duluth Engineering Company has begun the work of surveying this line between Virginia and Eveleth, Minn., which is the first section of the proposed line from Biwabik to Hibbing. F. B. Myers, president, Biwabik.

Michigan United Railways.—All but one mile of the right of way has been secured for the proposed line between Lansing and Jackson, Mich., and it is reported that arrangements for beginning construction will be made at once.

Milwaukee Electric Railway & Light Company.—Surveyors are now locating a line for an electric railway from North Milwaukee to Fox Lake, via Holy Hill, Menominee Falls, Lake Fire and Beaver Dam.

Missouri Interurban Railway.—J. W. Mellor, vice-president, Sedalia, Mo., writes that grading work is expected to begin in the spring on this road from Sedalia to Jefferson City, Mo., 79.2 miles. The route includes Smithton, Otterville, Saleville, Bunceton, Prairie Home, Cedron, California and Centertown, and has been entirely surveyed. J. D. Starke, Saleville, is president; E. W. Moore, Bunceton, treasurer; C. W. Thomas, Jefferson City, secretary; and B. W. Colby, 812 Security building, St. Louis, is chief engineer. Headquarters, Sedalia.

Montreal Street Railway.—This company has announced that work will be started in the spring on the following extensions: A double-track extension of the Craig street line to St. Vincent de Paul; a line from Peloquin's to Bordeaux, 2½ miles; an extension of the Lachine line from Stony Point to Dorval, about 5 miles; a line from St. Laurent to Ste. Genevieve, 9 miles. During the past year 20 miles of track has been renewed and the plans for the coming year include considerable double tracking. On January 1 the Montreal Terminal Railway will be operated as a part of the Montreal Street Railway system.

New Orleans & Baton Rouge Railroad.—C. D. Wyman, representing the Stone & Webster Engineering Corporation, of Boston, is going over this road, for which surveys have been made and right of way secured between New Orleans and Baton Rouge, La., with a view to taking the contract for the construction. Edward Godschaux, of New Orleans, is president.

New York, N. Y.—The board of estimate and apportionment on November 23 received from the rapid transit commission a notification that it was ready to advertise for bidders for the construction of four new subways, known as the Coney Island route, the Fourth avenue route, the Lexington avenue route and the Jerome avenue route, which amount to about 50 miles and will cost about $125,000,000. The approval of the board of estimate is required before bids can be asked. The matter was referred to a special committee.

New York & Long Island Railroad.—Justice Fitzgerald of the New York supreme court has granted a temporary injunction restraining the city of New York from interfering with the construction of the Belmont tunnel under the East River at Forty-second street. The city has questioned the legality of the company's franchise, but the court holds that the construction of the tunnel should be completed first, now that so much work has been done and the question settled later.

Northwestern Ohio Electric Railway.—E. C. Bell, of Toledo, O., is one of the promoters of this road, which is to run from Defiance, via Evansport and Bryan to Montpelier, O. Surveys are being made and it is stated that financial arrangements have been made and right of way secured.

Oakland Traction Consolidated.—This company has decided to build an extension of the Berkeley Traction Company in North Berkeley, Cal., on Grove street, from University avenue to the town line.

Pacific Traction Company.—A force of 150 men is now at work near South Tacoma on the Steilacoom branch of the American Lake line. The poles are being set up and a part of the wire has arrived ready for stringing. B. J. Felt, general manager, Tacoma, Wash.

Philadelphia Rapid Transit Company.—The management is now making strong efforts to have the Market street elevated railroad and the western section of the subway in operation by the first of the year. The contractors have increased their forces and shipments of materials are being hastened as much as possible. Forces of men are at work erecting the framework of the eight elevated stations on Market street between Thirty-second and Sixty-third streets and the first one is nearly completed. The part of the subway west of the City Hall is rapidly nearing completion. The rails for the temporary loop near City Hall are in place. The ventilating ducts are under construction. Work on the eastern part of the subway was delayed by the recent explosion but a large force of men is endeavoring to make up for lost time. The subway work east of the City Hall is being confined to that part of Market street between Eighth street and Delaware avenue.

Pittsburg Subway Company.—This company, which is seeking franchises for various subway routes in Pittsburg, has addressed a letter to the city council commission on subways asking for a conference at an early date in order to reach an agreement in regard to the provisions of an ordinance to be submitted. The letter asks for a discussion on such points as: Selection of routes, length of franchise, compensation, conditions to be imposed by the city, form of subway, etc.

Quebec & Saguenay Railway.—D. R. McDonald, secretary, writes that grading will not begin until about May, 1907, on this road from St. Joachim to Baié Ste. Catherine, Quebec. The route as proposed is 100 miles long and includes Grande Riviere,, Baié St. Paul, Les Eboulements, Ste. Irenee, Murray Bay, Cap-a-l'Aigle and St. Simeon. Surveys are now in progress between St. Joachim and Cap Tourmente, seven miles. The road is to be built along the St. Lawrence river and will enter the city of Quebec from St. Joachim over the tracks of the Quebec Railway Light & Power Company. There will be no heavy grades, but many curves will be necessary. President, R. Forget, Montreal; chief engineer, Jean Guay, Quebec; consulting engineer, J. McCarthy, Quebec. Headquarters, 132 St. Peter street, Quebec.

Richmond Street & Interurban Railway.—It is reported that this company, which now has a line between Richmond and Milton, Ind., is making surveys for an extension from Milton to Connersville, and that construction will begin in the spring. C. C. Reynolds, Indianapolis, general manager.

Spokane Interurban Railroad.—This company, recently incorprated to build an electric line from Spokane to Cheney, Wash., has received bids for the construction of 10 miles of line, from Hayford to Cheney. Mr. H. L. Bleecker, of Spokane, is interested in the project.

Toledo & Indiana Railway.—E. Darrow, manager and chief engineer, Toledo, O., writes that the extensions from Bryan, O., to Butler and Waterloo, Ind., 25 miles, and from Delta to Napoleon and Defiance, O., 24 miles, have been surveyed and that construction will begin March 1, 1907.

Twin City Rapid Transit Company. Contractor George J. Grant, of St. Paul, has started work on the excavation for the Selby avenue tunnel, in St. Paul, Minn. The present grade of the hill, 16 per cent, is to be reduced to 7 per cent in the tunnel, and the curvature at the foot of the hill as the tracks turn onto Third street will be reduced to less than 11 per cent. The length of the tunnel itself will be 920 feet, and with approaches 1,552 feet. The walls of the tunnel and of the approaches will be of reinforced concrete. The contractor expects to have the work completed by July, 1907. Engineer George L. Wilson, of the Twin City Rapid Transit Company, Minneapolis, is supervising the work.

United Railways (St. Louis, Mo.)—A plan has been submitted to the board of public improvements asking for permission to restore the company's tracks between Sarah street and the intersection of Old Manchester road and Chouteau avenue. This line would connect with the St. Louis & Suburban Railway and allow it to run its cars into the center of the city over the Market street line. Various plans are being made to unite the St. Louis & Suburban and the United Railways so as to give an improved service with universal transfers.

Utah Light & Railway Company.—At a recent meeting of the executive company plans were discussed for the rehabilitation of the system. It is stated that about $3,000,000 is to be expended for improvements, that the tracks are to be relaid with heavy rails and that new rolling stock is to be purchased. W. H. Banrails and that new rolling stock is to be purchased. A conference was held on November 20 between the Salt Lake City officials and the company's officers in regard to plans for improving the system. It was announced that new ties and heavy rails are to be laid on the city tracks, that extensions are to be built to Garfield, North Salt Lake, Sandy and Big Cottonwood, an auxiliary steam plant is to be erected and new cars purchased. W. H. Bancroft, president; O. A. Honnold, chief engineer.

Valley Traction Company (Chambersburg, Pa.).—Interests representing this company have secured control of the Chambersburg & Gettysburg and the Littlestown & Gettysburg turnpikes and will use them as right of way for several extensions. The Chambersburg & Gettysburg Electric Railway, which now runs from Chambersburg to Caledonia, will be extended to Gettysburg. A line will also be built from Gettysburg to Littlestown to connect with the line the York County Traction Company is building from York to Hanover and Littlestown. M. C. Kennedy, of Chambersburg, is president.

Wagner, S. D.—Plans are being considered for the construction next spring of an electric line from Wagner to Lake Andes, S. D.

Wausau Street Railway.—This company has suspended construction work for the winter, having laid three miles of track in Wausau, Wis., and nearly two miles of track on the interurban line from Wausau to Schofield.

Wichita Railroad & Light Company.—It is reported that this road is to be extended from Wichita, Kan., to Wellington and Arkansas City. S. L. Nelson, of Peoria, Ill., general manager.

York County Traction Company.—It is stated that this company plans to begin work in the spring on the construction of 125 miles of new line in York county, Pa., including lines to Spring Grove and Hanover, Paradise, Loganville and Glen Rock, Wellsville and Dillsburg and Yorkana. President W. F. B. Stewart, of New York, is quoted to the effect that the bonds for the extensions have been underwritten.

POWER HOUSES AND SUBSTATIONS.

Birmingham Railway Light & Power Company.—This company has purchased a tract of land at North Birmingham, Ala., on which, it is reported, a power house will be built.

Chicago City Railway.—New machinery has been installed in the substation at Plymouth place and Harrison street, where power is received from the Commonwealth Electric Company, to increase the power pressure in the loop district.

Cleveland & Southwestern Traction Company.—This company is considering the question of installing an additional power house and the Roberts & Abbott Company, of Cleveland, has had a corps of engineers investigating the situation to determine as to the necessity of a new power house and the economic location of such a power house if it is decided to be necessary.

Corinth & Shiloh Electric Railway.—W. W. Williams & Co., of Nashville, Tenn., the contractors for this road, have broken ground for a power house east of Corinth, Miss., at the junction of the Illinois Central and the Southern railways. The building will be 60 feet. x 80 feet and will contain boilers of 2,150 horsepower and four dynamos of 500 horsepower each.

Denver City Tramway Company.—This company has under consideration plans for increasing the capacity of its main generating station at Denver, Colo. A. M. Ballou, of Denver, electrical engineer.

East St. Louis & Suburban Railway.—This company is installing two additional power units, of 1,250 horse-power each, in its power station at East St. Louis, Ill. The company has also purchased a site in Belleville, Ill., on which to erect a substation, to provide for several extensions.

Illinois Traction Company.—A site has been purchased near Danvers, Ill., which will be used for a brick and concrete building a depot and substation, 100x25 feet, for the Bloomington-Peoria line.

Indiana Columbus & Eastern Traction Company.—This company is planning to abandon the Brookville power house of the old Dayton & Northern and will probably use it as a substation, taking power for the Dayton & Northern division from the Medway power station.

Indianapolis Newcastle & Toledo Electric Railway.—Allis-Chalmers Company, which has the contract for equipping this road, has sublet the contract for the erection of the power house, located west of Newcastle, Ind., to Pulse & Porter, of Greensburg, Ind.

Montreal Street Railway.—The Canadian General Electric Company, Limited, will soon install two railway generators of 2,500 and 1,250 horse-power capacity in the new power house being built in the East End.

New York Westchester & Boston Railroad.—It is announced that work has been started on the power house near Pelham Park, N. Y.

Northern Indiana Railway.—Plans are being prepared for a large power house at South Bend, Ind. Work is in progress on an extension from South Bend to Laporte. J. McM. Smith, of South Bend, general manager.

Omaha & Council Bluffs Street Railway.—The directors have appropriated $250,000 for the purchase of new power equipment at Omaha and two substations, at South Omaha and Benson, to reduce the current to 500 volts. It is stated that the directors will soon make appropriations for several other improvements and extensions. H. B. Noyes, chief engineer, Omaha, Neb.

Pueblo & Suburban Traction & Lighting Company.—This company is making some important changes in its power station at Pueblo, Colo. The main reciprocating engine units will be supplemented by a 2,000-kilowatt turbine unit, new condenser equipment is being installed and the switchboard is being overhauled.

Sioux City Traction Company.—This company is making extensive additions to its power plant, installing new boilers, generators, etc., amounting to about $250,000. Crane Company, Sioux City, are furnishing the valves and fittings, many of which are of special pattern.

South Side Elevated Railway.—This company has recently installed in its power house at Fortieth and State streets, Chicago, two Allis-Chalmers vertical cross-compound 38 and 80 by 60-inch engines of the condensing type. These engines are equipped with the Corliss valve gear and are designed for a speed of 70 revolutions per minute. Each is direct connected to a 2,000-kilowatt 640-volt direct-current generator.

Tampa & Sulphur Springs Traction Company.—J. E. Bates & Co. has been awarded a contract to erect a power house for this company at Tampa, Fla., which is to be 104x104 feet, of sand-lime brick, and to cost $15,000. The contract for the brick work has been let to McGucken Bros.

Toledo Railways & Light Company.—This company is greatly increasing the capacity of its power house at Toledo by the installing of new machinery, of which two 4,000-horsepower steam turbines have been ordered, to be installed in January and February, and two 1,300-horsepower rotary converters, one 1,300-horsepower motor-generator, a 200-horsepower motor-generator set, and a large switchboard have already been installed. Four 700-horsepower water-tube boilers and a new coal-handling apparatus are now being installed. E. J. Bechtel, chief electrician, Toledo.

SHOPS AND SHOP EQUIPMENT.

Indiana Union Traction Company.—Bids were submitted on November 24, for the erection of the car shops in Anderson. The main building will be 481x306 feet, and another building will be 80x112 feet. Both will be fireproof. All of the buildings must be completed by July 31, 1907, according to the franchise contract. The cost is estimated at from $125,000 to $150,00.

Inter-Urban Railway (Des Moines, Ia.).—This company will soon begin work on a storage barn and car shops on Bluff street between Center and North streets, Des Moines.

Los Angeles-Pacific Railway.—Work has been started to enlarge and improve the car shops and car barns at Sherman, Cal.

Northern Ohio Traction & Light Company.—Specifications and plans have been submitted for a new car barn at Akron, O., to cost $10,000, but as yet no contract has been let.

Philadelphia & Western Railway, Llanerch, Pa.—This company is installing a complete heating and ventilating equipment in its new car barn at Llanerch, Pa., which contains over 600,000 cubic feet of space. The apparatus consists of an engine-driven fan with heater and distributing system furnished by the B. F. Sturtevant Company, Boston, Mass.

Pittsburg Railway & Light Company (Pittsburg, Kan.).—It is reported that plans are being prepared and that some of the preliminary work is being done for new car barns at Scammon, Kan., which will be 200 feet long.

Rochester Railway Company.—This company has applied for permits for a car storage building on Federal street, Rochester, N. Y., at an approximate cost of $50,000. The building will be of brick and concrete, 137x400 feet.

St. John Railway.—F. N. Bundie, architect, St. John, N. B., is preparing plans for a large car house on Union street.

Seattle Electric Company.—This company has secured permits for the construction of five new fireprof reinforced concrete buildings in Georgetown, Wash., covering 130,000 square feet of ground. The buildings will cost about $1,000,000 and include a storeroom, car house, machine shop, erection shop and paint shop.

Sedalia Transit Company.—This company has let the contract for the erection of a large car house at the southwest corner of Ninth street and Ingram avenue, Sedalia, Mo., and work on the foundation has commenced. The building will be of brick and stone, 300 by 100 feet in area. F. A. Clark, chief engineer, Sedalia, Mo.

Toronto Hamilton & Buffalo Railroad.—The car shops at Hamilton, Ont., were burned on November 1, with a loss of $10,000.

United Railways & Electric Company.—This company has decided to build nine new car barns in and near Baltimore, Md. Plans are being prepared and property has been purchased. The Noel Construction Company has been awarded a contract for building the car house at Arlington avenue and York road, Baltimore. The building will be 138 by 405 feet, of reinforced concrete, and will cost about $130,000. Baldwin & Pennington are the architects. The same architects will also prepare plans for another car barn at Druid Hill and Fulton avenues.

FRANCHISES.

Alton, Ill.—The Alton Jacksonville & Peoria Railway has applied for a franchise on Belle street from Fifth street to Third street.

Atlanta, Ga.—The city council has passed over the mayor's veto the franchise which was granted some time ago to the Atlanta & Carolina Electric Railway, which proposes to build from Atlanta to Conyers and West Point.

Benton Harbor, Mich.—A 30-year franchise has been granted to the Benton Harbor-St. Joe Railway & Light Company to build three loops in the city. The company agrees that within two years it will have an interurban line in operation between Benton Harbor and Eau Claire and Dowagiac, or between Benton Harbor and Watervliet.

Blytheville, Ark.—A 50-year franchise has been granted to the Blytheville Electric Light, Water & Street Car Company, which proposes to build a street railway from Blytheville to Chickasawka, Ark.

Bryan, O.—The Northwestern Ohio Electric Railway has applied for a franchise, offering to locate its power house and car shops in Bryan if it is granted. The line will extend from Defiance through Bryan to some point in Michigan.

Chester, S. C.—The city council has granted a 50-year franchise to J. B. Westbrook and J. L. Reading, of Chester, and J. E. Brady, of Chicago, to build an electric street railway in the city.

Clayton, Mo.—The St. Louis county court has granted a franchise to the St. Louis Fern Ridge & Western Railway for a double track line on Etzel avenue and Olive street to Creve Coeur Lake and the St. Louis county fair grounds.

Dayton, O.—The Cincinnati Northern Traction Company has applied for a franchise to double track its line on Fourth street and to lay double track curves at Maine and Ludlow streets.

Defiance, O.—The Columbus & Lake Michigan Railroad, which is to be electrified and operated as a part of the Indiana Columbus & Eastern Traction Company's system, has been granted a franchise.

Donaldson, La.—The town council has granted a 25-year franchise to P. S. Schneidau to build a street railway system through the town.

Dunkirk, N. Y.—The city council has granted the Dunkirk Street Railway an extension of time to July 1, 1907, in which to build its belt line.

Ennis, Tex.—The city council has granted a franchise to the Central Texas Traction Company, which proposes to build from Dallas to Waxahachie and Ennis, Tex.

Evanston, Ill.—The Evanston & Interurban Electric Railway, recently incorporated to build from Glenview to Evanston, has applied for a franchise. Wesley A. Stanger, of Evanston, is president.

Flint, Mich.—The city council has granted a franchise to the Detroit Flint & Saginaw Electric Railway, which proposes to build a line between the towns named in the title. The ordinance carries a provision for eight tickets for a quarter between the hours of 5 and 8 in the morning and 5 and 8 in the evening.

Ft. Scott, Kan.—The Southwestern Traction Company, which proposes to build an electric line from Cherryvalle to Independence and Chanute, Kan., has applied for a franchise in Fort Scott.

Fremont, O.—Webb C. Hayes and J. W. Worst have applied for a franchise for an electric railway through certain streets.

Gainesville, Ga.—Dr. Andrew Sledd, of Gainesville, is at the head of a company which has applied for a franchise for a street railway on the principal streets of the city.

Kenosha, Wis.—The Chicago Kenosha Milwaukee & Lake Geneva Railway, which proposes to build an electric railway from Kenosha to Lake Geneva, Ill., has applied for a franchise.

Lisbon, O.—The city council has granted the Youngstown & Ohio River Railroad a franchise to build lines on East Walnut and East Chestnut streets and Pritchard avenue.

McKinney, Tex.—A franchise has been granted to the Texas Traction Company, which proposes to build from Dallas to Sherman, Tex. J. F. Strickland, of Dallas, is president.

Milwaukee, Wis.—A franchise has been granted to the Milwaukee Northern Railway, which is building a line from Milwaukee to Sheboygan and Fond du Lac. The franchise provides for a three-cent fare in the city. J. M. Saemann, of Sheboygan, is president.

Mineola, N. Y.—The supervisors of Nassau county have granted the Huntington Railroad, of Huntington, N. Y., a franchise through Oyster Bay.

New Rochelle, N. Y.—The common council has granted the New York Westchester & Boston Railroad a franchise through the town for either an overhead or underground line, offering a choice of two routes. The company agrees to have the road in operation in three years.

Noblesville, Ind.—The city council has granted to Wallace B. Campbell, of Anderson, Ind., an extension of time to November 15, 1908, in which to begin work on his interurban line from Anderson to Noblesville, Lebanon and Crawfordsville. Similar extensions will be asked in the other towns.

Pomona, Cal.—A franchise has been sold to the Pacific Electric Railway, of Los Angeles, Cal., for an electric railway through Holt, Garey and Fifth avenues and Second street. The company is under bond to begin work within four months from November 7, and to have three miles of railway in Pomona in operation within a year.

St. Joseph, Mo.—The St. Joseph Belt & Interurban Railway recently incorporated to build from St. Joseph to Savannah, Mo., has applied for a franchise for about 2½ miles of double-track line in St. Joseph. John Townshend, of St. Joseph, is one of the incorporators.

St. Louis, Mo.—A franchise has been granted to the North St. Louis & Suburban Railway for a double-track road from the city limits of St. Louis out the Hall's Ferry road to the Jennings Station road. The company was incorporated several months ago and has secured a city franchise from the city limits to Broadway on Hall's Ferry road. John Scullin, of St. Louis, is interested.

San Antonio, Tex.—The San Antonio Traction Company has been granted permission to build an extension to Tobin Hill. Construction will begin in the spring.

San Francisco, Cal.—John J. Eagan, of San Francisco, has applied for a 25-year tranchise for an electric road over the route of the present Geary street system, with a branch on Point Lobos and Cliff avenues.

Van Alstyne, Tex.—The city council has granted a franchise to the Texas Traction Company.

Vancouver, Wash.—The city council has granted a 50-year franchise to W. H. Moore and L. B. French, of Portland, Ore., for an electric street railway.

Waxahachie, Tex.—The city council has granted the Central Texas Traction Company, of Dallas, a 50-year franchise through the town for the line which this company proposes to build from Dallas to Waxahachie and Ennis, Texas.

FINANCIAL

Amherst & Sunderland Railway (Amherst, Mass.).—At the recent annual meeting of this company the officers were all re-elected. The financial statement for the year ended September 30, 1906, showed gross earnings of $38,488; operating expenses, $28,165; net earnings from operation, $10,323. W. D. Cowls, president, North Amherst Mass.

Cincinnati Toledo & Detroit Short Line Railway Company.—Stockholders of this company have applied in the common pleas court at Toledo, O., for the appointment of a receiver

City Electric Railway (Rome, Ga.)—Atilla Cox, Jr., and S. S. Busch of Louisville, Ky., have purchased the electric railway system of Rome, Ga., from J. L. Bass, president. It is reported that the consideration is approximately $175,000.

Columbus Delaware & Marion Railway.—This company has given a mortgage of $200,000 to the Cincinnati Trust Company.

Consolidated Railway.—This company, which owns the New York New Haven & Hartford Railroad's electric railway properties, has purchased a controlling interest in the Ray system of street railways in Rhode Island, which includes the Providence & Burrillville Street Railway, the Columbian Street Railway, the Woonsocket Street Railway and the Milford Attleboro & Woonsocket Street Railway. These roads all belonged to the estate of the late Edgar K. Ray, of Franklin, Mass. It is persistently reported that the Consolidated Railway Company is also endeavoring to purchase the control of the Rhode Island Company, of Providence, R. I., which is owned by the United Gas & Improvement Company, of Philadelphia.

Des Moines City Railway.—This company's suit against the city of Des Moines was heard on December 3. The company is seeking an injunction restraining the city from interfering in any way with its rights in the streets, claiming that its franchise is perpetual. The city is endeavoring to have the franchise revoked.

Hoboken & Manhattan Company.—The Hoboken & Manhattan Railroad and the Hudson & Manhattan Railroad, which are building tunnels under the Hudson river from New Jersey to Manhattan Island, have filed articles of consolidation under the name of the Hoboken & Manhattan Company, capitalized at $38,500,000, of which $15,000,000 will be 6 per cent cumulative preferred stock. About two weeks ago the Hoboken company increased its capital stock from $500,000 to $15,000,000 and the Hudson company increased its stock from $100,000 to $17,100,000. The consolidation thus provides for a further increase of $6,400,000. The officers of the new company are: Alexis P. Bartlett, of New York, president; Edward R. Greene, of Brooklyn, vice-president; Ross A. Mackey, Brooklyn, secretary, and Neil A. Wethers, New York, treasurer.

Indianapolis Huntington Columbia City & Northwestern Railway.—T. A. Bell, of St. Louis, has been elected president of this road in place of Mr. C. E. Merrifield, Indianapolis, who continues as a director. It is understood that Mr. Bell has agreed to finance the road and he is now in New York making the necessary arrangements. The road as projected will connect Indianapolis and Goshen, Ind. About 15 miles, between Syracuse and Vawter Park, have been graded. A. E. Wiest, of Indianapolis, is general manager.

Indianapolis Traction & Terminal Company.—This company has leased for 99 years the property on West Market street just west of the train sheds of the Terminal station and will use it for additional trackage room. The property has a frontage of 76 feet and extends back 195 feet to Wabash street.

Laconia (N. H.) Street Railway.—This company's stock has been transferred to Henry L. Pierce, of Leominster, Mass., and new officers have been elected, as follows: President, H. L. Pierce; treasurer, E. P. Hadley, Leominster; secretary and manager, L. E. Pierce, Laconia. Mr. Pierce has also purchased the Laconia Electric Lighting Company.

Louisville & Interurban Railroad—This company has filed an amended charter, giving it the privilege of increasing its capital stock from $500,000 to $1,000,000, and of building a line to Mt. Washington, 18 miles from Louisville, Ky., and a 10 mile extension out Floyd street. J. T. Funk, superintendent, Louisville, Ky.

Macon Americus & Albany Electric Railway.—Nicholas J. Cruger, of Albany, Ga., has been elected president of this company, which proposes to build electric lines connecting Macon with Americus, Albany, Griffin and Atlanta, Ga. The Macon & Albany Securities Company, of Macon, is backing the project.

Manila Electric Railroad & Lighting Corporation.—The operating department of J. G. White & Co. reports the gross earnings of this company for November as $76,000 and net receipts $36,000. The earnings of the railway department reflect the continued and regular use of the street railway by the natives.

Merger of Indiana Syndicate Lines.—Plans for the organization of a large holding company to include all the Indiana traction lines owned by the Schoepf-Morgan-McGowan syndicate, represented in Indiana by Hugh J. McGowan, of Indianapolis, are gradually being worked out and it is thought that incorporation papers will be filed by the first of the year. No official announcement has been made, but it is stated that lawyers are at work on the details, with the expectation of completing the plan this month. The lines now owned by the syndicate and which it is reported are to be merged are: The Indiana Union Traction Company 319 miles, Fort Wayne & Wabash Valley Traction Company, 172 miles; Indianapolis & Northwestern Traction Company, 93 miles; Indianapolis & Eastern Railway 91 miles; Indianapolis & Martinsville Rapid Transit Company, 30 miles; Indianapolis & Western Railway, 12 miles; Richmond Street & Interurban Railway, 28 miles, and the Indianapolis Coal Traction Company, 14 miles; making a total of 759 miles, besides several miles of new line under construction.

Montgomery Traction Company (Christiansburg, Va.)—This company, which proposes to build an electric line between Christiansburg and Cambria Va., about two miles, has been organized with the following officers: Charles A. Johnson, president, E. S. Hagan, secretary and general manager, and Charles I Wade, treasurer. The route has already been surveyed and the rails and much of the material nave been purchased. It is expected that the construction will be completed this fall. Power will be furnished by the Grayson Electric Corporation of Snowville, Va.

Nashville Railway & Light Company.—At a meeting of the stockholders on November 10 the directors were authorized to issue a $15,000,000 mortgage bond to take up outstanding bonds and provide for improvements and extensions; to sell $500,000 preferred and $500,000 common stock; and to apply for an amendment to the charter to provide for new lines in Nashville and extensions of the present lines.

Nevada Transit Company.—This property, which consists of an electric line 4½ miles long between Reno and Sparks, Nev., has been purchased from the Nevada Power Light & Water Company, of Reno, by Senators Francis G. Newlands and George S. Nixon, who plan to extend the road south.

New Castle & New Wilmington Railway Company.—This company, which proposes to construct a trolley line between New Castle and New Wilmington, Pa., has effected a permanent organization with the following officers: President, J. H. Veazey; secretary, J. J. Ashenhurst; treasurer, G. H. Getty. Office, New Castle, Pa.

New York Westchester & Boston Railroad.—It is announced that this company, which is building a road from One Hundred and Seventy-seventh street in the Bronx through Mt. Vernon, New Rochelle, Port Chester and White Plains, N. Y., to the Connecticut state line, has absorbed the New York & Port Chester Railroad, which held franchises and was opposing it in several towns along the route. The Westchester road is capitalized at $20,000 and the Port Chester road at $250,000. The deal was consummated by Oakleigh Thorne, president of the Day and Night Bank, New York. The Westchester company has already spent about $1,500,000 in construction work in the Bronx and in Mt. Vernon and it is believed that the new deal insures its completion. W. L. Bull, president, New York.

Norfolk & Portsmouth Traction Company.—This company has purchased the Norfolk & Atlantic Terminal Company, which operates a line between Norfolk, Va., and the Jamestown Exposition Grounds and Pine Beach, a distance of six miles, with a ferry from Pine Beach to Newport News. The road is to be rehabilitated for the Jamestown Exposition. The road was controlled by the Newport News & Old Point Railway & Electric Company.

Quebec Railway & Light Company (Quebec, Que.)—The financial report for the year ended June 30, 1906, contains the following items:

Assets.

Road and equipment, real estate, buildings, etc., including Kent House	$5,634,275.44
Cash on hand and in bank	21,478.83
Power division—operating, including accounts due, stores for operating equipment, etc	42,104.18
Kent House, operating account	10,972.55
Citadel division—operating account, represented by stores on hand	14,433.02
Montmorency division—operating account, stores on hand, cash assets, etc	35,234.89
Accounts receivable	9,627.72
	$5,768,126.63

Liabilities.

Capital stock		$2,500,000.00
Bonds		2,500 000.00
Preferred capital stock	$500,000.00	
Less in treasury	171,000.00	
		329,000.00
Bills payable		16,466.28
Accrued interest account		23,862.12
Accounts payable and other liabilities		100,174.26
Profit and loss account		298,623.97
		$5,768,126.63

Profit and Loss Account.

Balance at credit of profit and loss account, June 30, 1905		$ 211,629.85
Net earnings for year 1905-1906	$229 753.67	
Less interest on bonds, dividends on preferred stock and interest paid and accrued	142,759.55	
		86,994.12
Balance at credit of profit and loss account, June 30, 1906		$ 298,623.97

Oswego (N. Y.) Traction Company.—This company, which operates 11½ miles of road between Oswego and Minetto, N. Y., has been purchased by the syndicate of which C. D. Beebe, of Syracuse, is at the head, which owns the Rochester Syracuse & Eastern Railway, the Auburn & Syracuse Electric Railroad, and the Syracuse Lake Shore & Northern Railroad. The consideration is said to have been $250,000.

Sioux City Homer & Southern Electric Railway.—This property, which includes a track between South Sioux City and Dakota City, Ia., but which has never been operated, has been sold by W. R. Burch, of Chicago, who recently bought it, to Joseph A. Foye, of Sioux City. Mr. Foye announces he has placed orders for cars and that the line will be ready for operation within 60 days.

Texarkana Light & Traction Company.—This company has been purchased by the Texarkana Gas & Electric Company, and the new owners, who have taken charge, expect to rebuild and greatly improve the system.

Tokio, Japan.—The municipal assembly has defeated a proposition that the city purchase the street railways and operate them as a municipal undertaking.

Toledo & Western Railway—This property, which includes a line from Toledo to Pioneer, O., with a branch to Adrian, Mich., has been sold at auction to J. R. Nutt, representing the Citizens' Trust & Savings Bank, of Cleveland, for $337,575, the amount of the claims against the company. The road has been in a receiver's hands since July last. Judge C. M. Stone, of Cleveland, is president.

Troy Rensselaer & Pittsfield Electric Railway.—This company, which owns some franchises and right of way between Pittsfield, Mass., and Troy, N. Y., has been purchased by Allan W. Paige and associates, of Bridgeport, Conn., for $58,000. Officers have been elected as follows: President, Allan W. Paige; vice-president, W. H. Sterling, of Brooklyn; secretary, Alexander Keough, of New York; treasurer, H. L. Merritt, of Montclair, N. J.

Twin City Rapid Transit Company.—This company has purchased the North Side Street Railway, of which A. B. Robbins, of Minneapolis, is president. The property consists of a line from Minneapolis to Robbinsdale, Minn., with franchises for an extension to Osseo and Anoka. Through service will be instituted between Robbinsdale and Minneapolis.

United Railroads of San Francisco.—This company is reported to have secured control of the California Street Cable Railroad, through purchases of stock.

United Railways (Portland, Ore.).—Twenty-five stockholders of the Oregon Traction Company, represented by L. Y. Keady, have brought suit against this company to recover $39,835, which they allege is due them as a condition of the sale of the property and franchises to the United Railways on March 15. The plaintiff states that the United Railways Company agreed to reimburse the stockholders for the amount they had paid in on their stock, which it is declared, aggregates $39,835.

Washington Water Power Company (Spokane, Wash.)—This company has taken over the Spokane Cheney & Southern road, organized to build from Spokane to Cheney and Hayford, Wash., and expects to complete the line by next July. Henry M. Richards, Spokane, president.

RECENT INCORPORATIONS.

Champaign & Kankakee Electric Railroad.—Incorporated in Illinois to build an electric railway from Chicago Heights to Champaign, via Kankakee. Capital stock, $100,000. Incorporators: L. D. Risser, of Kankakee; R. A. McCracken, of Paxton; Upton Schaub, of Watseka; F. L. Butterfield, C. V. Donovan, C. O. Patten and W. J. Root, of Chicago.

Cleveland Alliance & Mahoning Valley Railroad.—Incorporated in Ohio to build an electric railway from Cleveland to Alliance, connecting at the latter point with the Stark Electric Railroad which runs to Canton and Salem. A branch will also be built from the main line to Youngstown. Land has been purchased to a connection with the Cleveland Electric Railway in Cleveland and right of way has been secured from Cleveland to Alliance. Capital stock, $10,000. James W. Holcomb, of Cleveland, is the promoter.

Lancaster Traction & Power Company.—Incorporated in Ohio to take over the existing street railway, lighting and power plants of Lancaster, O., including the Fairfield Traction Company and the Lancaster Traction Company. Capital stock, $400,000. Incorporators: Philip R. Peters, Edward Delancy, McClellan Matens, Louis J. Snyder and Philip Rising. Headquarters, Lancaster, O.

Ludington Southern Railway.—Incorporated in Michigan for the purpose of building a railroad from Grand Rapids to Ludington, Mich., about 80 miles. Capital stock $640,000. Incorporators: Norman W. Gifford, Chicago; David H. Patterson and Samuel H. Kelly, of Benton Harbor, Mich.; Thomas J. David and Gardner T. Sands, Pentwater, Mich.

Milwaukee & Fox River Valley Railroad (Fond du Lac, Wis.)—Incorporated in Wisconsin to build an interurban railway from Cedarburg to Appleton, by way of Grafton, Saukville, Plymouth, Kaukauna and Fond du Lac. Capital stock, $25,000. Incorporators: Franklin Phillips, J. M. Saemann, George Brickbauer, P. P. Brickbauer, J. P. Connell, A. J. Pullen, R. H. Crosby and W. H. Phillips. It is stated that this road will secure an entrance to Milwaukee over the tracks of the Milwaukee Northern of which J. M. Saemann, one of the incorporators, is president.

Milwaukee Western Electric Railway.—Incorporated in Wisconsin to acquire or construct and operate an electric railway in the city and county of Milwaukee. Capital stock, $5,000. Incorporators: George W. Schermuly, H. J. Janzer and William Ross of Milwaukee, Wis.

Oklahoma Railway.—Incorporated in Oklahoma for the purpose of building an electric interurban line as follows: West from Shawnee to El Reno and Fort Reno, with a line from Shawnee to Tecumseh; from Guthrie south to Purcell, and from Yukon southwest to Chickasha, a total of 170 miles. Capital stock, $5,000,000. Incorporators: Frank Wells, O. R. Rittenhouse, G. G. Barnes, J. J. Johnson, Carlos Combs, Fred S. Combs and Edward L. Lawson, all of Oklahoma City.

Oakland Traction Company.—Incorporated in California to take over the Oakland Traction Consolidated, which controls several smaller companies in and near Oakland, Cal., the San Francisco Oakland & San Jose Railway, and the Berkeley Traction Company, recently incorporated. Capital stock, $17,925,000. Incorporators: E. A. Heron, H. Wadsworth, F. W. Frost, F. M. Smith, F. C. Havens, Samuel J. Taylor and W. H. Martin, all of Oakland, Cal. Most of these men are officers of the Oakland Traction Consolidated.

Ozark Transit Company.—Application has been made for a charter in Missouri to build an interurban line from Waynesville, Pulaski county, through Jefferson City to Mountain Grove, Wright county. Capital stock, $50,000. Incorporators: Warren E. Burns, Philadelphia, Pa.; E. A. Lee, St. Louis, Mo.; Bertram Brown, Glendale; G. W. Gann, Waynesville, and J. J. Burns, Webster Grove.

Pacific & Eastern Railway.—Incorporated in Washington to build a railroad between South Bend and Chehalis, Wash. Capital stock $150,000. Incorporators: W. S. Cram, Jacob Siler, and T. H. Donovan, of Raymond, Wash.; S. L. Hyman, F. G. and H. G. Schoemaker, of South Bend; and Walter G. Hyman, of Burlingame, Cal.

Peoria & Canton Railway.—Incorporated in Illinois to build from Peoria to Canton, Ill. Work is to be started at once on the surveys and it is stated that the road is to be in operation next summer. Capital stock, $25,000. The incorporators, who are associated with the Illinois Traction Company, are: Charles Zilly, R. H. Watson, Jr., C. R. Little, J. C. Eversman and George M. Mattis.

Puyallup Valley Northern Rapid Transit Company.—Incorporated in Washington to build an electric road from Tacoma to Puyallup and Orting, for both freight and passenger service. Capital stock, $3,000,000. Incorporators: Fred J. Chamberlain, John Mills, F. S. Martin, W. R. Scott, Charles Fulmer, L. A. Chamberlain, August Von Boecklin, L. C. Stevenson and H. H. Blackburn.

Richmond & Henrico Railway Company.—Incorporated in Virginia to acquire the Citizens' Rapid Transit Company, which holds a charter for an electric railroad in Richmond. Capital stock, $10,000. Incorporators: W. F Jenkins, W. S. Forbes, W. P. Forbes, John C. Hagan, S. L. Kelley, John J. Blake and Edward L. Ryan, all of Richmond, Va.

Rome Railway & Light Company.—This company has applied for a charter in Georgia as a reorganization of the City Electric Railway, of Rome, Ga., which was recently purchased by Louisville capitalists. Capital stock, $500,000. Incorporators: S. A. Culbertson, L. W. Botts, Attilla Cox, Henry Weissinger, John L. Helm, James P. Helm, S. S. Bush, J. D. Stewart and C. E. Claggett, of Louisville, Ky.; J. W. Ewing and J. E. Dean, of Rome, Ga.

Springfield Belt Railway.—Incorporated in Illinois by interests associated with the Illinois Traction Company to build an electric belt line around the north and east sides of Springfield, with spurs to the coal fields, connecting at Starne with the interurban lines to Lincoln and Decatur. Right of way has been secured and it is said that construction will begin in the spring. Capital stock, $5,000. Incorporators: J. E. Johnson, of Danville; George M. Mattis, B. E. Bramble, Charles Zilly and W. H. Birke, of Champaign.

Springfield Wilmington & Cincinnati Railway.—Incorporated in Ohio to build an electric railway from Springfield to Cincinnati, through the counties of Clark, Green, Clinton, Warren and Hamilton, with a branch from the main line in Green county to Xenia. Capital stock, $3,000,000. Incorporators: George F. Parmalee, Frederick Gargenhire, William C. Morton, Gustav Von den Steinen, Richard Ingliff, Julian W. Tyler and Horace Andrews. Headquarters, Springfield, O.

Tecumseh & Norman Traction Company.—Incorporated in Oklahoma to build an electric railway from Tecumseh across Pottawatomie and Cleveland counties to Norman, at an estimated cost of $650,000. Incorporators: George Weed, of New York; Samuel B. Mitchell, Charles G. Stanford, Martin H. Tennison and James T. Butler, of Tecumseh.

Union Belt Railway.—Incorporated in California to build an electric line 3½ miles long in Alameda county. Capital stock, $500,000. Incorporators: George B. M. Gray, Oscar F. Long, Thomas P. H. Whitelaw, James S. Hawkins, W. J. Casey, John R Hart, Julius A. Landsberger and R. M. Fitzgerald.

Western New York & Pennsylvania Traction Company.—Incorporated in New York to consolidate the Olean Street Railway, of Olean, N. Y., and the Bradford Electric Street Railway, of Bradford, Pa. Capital stock, $2,000,000. Incorporators: Wilson R. Page, Olean; Joseph B. Mayer and William F. Sheehan, of New York.

ROLLING STOCK

Detroit United Railway Company, Detroit, Mich., is receiving 50 new cars.

Toronto Railway Company is building six cars for shipment to Monterey, Mex.

Boston & Worcester Street Railway, Boston, Mass., is in the market for 10 express cars.

Savannah Electric Company, Savannah, Ga., is reported will soon receive eight new cars.

United Railroads of San Francisco has ordered 250 cars from the St. Louis Car Company.

Niagara St. Catherines & Toronto Railway, St. Catherines, Ont., is in the market for four cars.

Springfield Clear Lake & Rochester, Rochester, Ill., is reported to have placed an order for cars.

Chicago & Southern Traction Company is reported in the market for a number of new cars.

Syracuse Rapid Transit Company, Syracuse, N. Y., is reported to have placed orders for 25 cars.

Terre Haute Traction & Light Company has ordered eight 52-foot closed cars from the Jewett Car Company.

Northern Electric Company, Chico, Cal., is in the market for a number of coaches for interurban service.

Georgia Railway & Electric Company, Atlanta, Ga., is reported will place orders for a number of double truck cars.

Grand Rapids, Holland & Chicago, Holland, Mich., has placed orders for two express cars and several box and flat cars.

Colorado Springs & Interurban Railway Company, Colorado Springs, Colo., is building several heavy cars for city and suburban service.

Michigan United Railways Company, Lansing, Mich., according to press reports from Kalamazoo, has ordered seven vestibule cars from the St. Louis Car Company.

Western Ohio Railway Company, Lima, O., and Toledo Urban & Interurban Railway Company, Toledo, O., are reported to be preparing specifications for 10 new coaches.

Indianapolis Columbus & Southern, Columbus, Ind., has ordered three cars from the Niles Car & Manufacturing Company, and it is reported will order three additional cars.

American Railways Company, Philadelphia, has placed an order with the Jewett Car Company for 10 45-foot closed cars to be used by the People's Railway Company, at Dayton, O.

United Railways & Electric Company, Baltimore, Md., it is stated will order for service next summer a number of semi-convertible cars including 40 cars for high speed interurban service.

Virginia Passenger & Power Company, Richmond, Va., is about to receive 20 double truck cars for use on the city lines, deliveries calling for five during December and the balance early in 1907.

Georgia Railway & Light Company, Atlanta, Ga., in addition to the 25 single-truck cars built in its shops and 5 double-truck cars previously reported, has placed orders for 10 double-truck cars for April, 1907, delivery.

Tri-City Railway & Light Company, Davenport, Ia., is reported will build 10 cars in its Rock Island shops, work to be commenced immediately. It is understood that 20 more cars will be built immediately following the completion of the 10 just ordered.

Denver City Tramway Company, Denver, Colo., has recently placed an order with the Woeber Brothers Carriage Works, Denver, Colo., for 30 car bodies. The new cars are designed for city use and will have center entrances and be equipped with two motors per car, one on each truck.

People's Railway Company, Dayton, O., as previously reported, has ordered 10 semi-convertible cars from the Jewett Car Company for March, 1907, delivery. The specifications call for the following:

Seating capacity	52	Width, over all	8 ft. 2 in.
Length—		Height, track to trolley base	11 ft. 6¼ in.
Body	32 ft.	Body and underframe	Wood
Over vestibule	44 ft.		

Special Equipment.

Airbrakes	General Electric	Headlights	Crouse-Hinds
Brake rigging	Peacock	Interior finish	Oak
Center bearings	Baltimore	Motors	Four G. E.-80
Control system	Sprague	Safety tread	Stanwood
Curtain fixtures	Curtain Supply Co.	Sanders	Ham
Curtain material	Pantasote	Seats	Rattan covered
Door fastenings	Wallace	Side bearings	Norwood
Hand brakes	Ratchet	Trolley poles and attachments	Milloy
Heating system	Electric	Trucks	Brill G-27

Boston Elevated Railway, Boston, Mass., has placed an order with the St. Louis Car Company for 100 easy access semi-convertible cars of wood construction for delivery on or before May 1, 1907. These cars are without platforms and are to seat 52 passengers. The sliding doors are to be operated pneumatically by the motorman. The specifications include the following: Length of car over all, 46 feet 2 inches; width, 8 feet 6 inches; height inside 8 feet $3\frac{1}{2}$ inches; height from track to trolley base, 12 feet. Special equipment: Air brakes, Westinghouse; heaters, electric; headlights, Kirby Neal electric; ventilators, Perry; interior finish, cherry; other equipment, company's standard.

Inland Empire System, Spokane, Wash., has received during the past season for the Spokane Traction Company 15 cars of the St. Louis type. The cars have been placed in service and are equipped with four motors each, single end control equipment, type 101B Westinghouse brakes, will seat 50 passengers and carry a maximum of 175 persons. Nine of the cars have Brill 27-F trucks and six have St. Louis trucks.

TRADE NOTES

Solid Steel Tool & Forge Company, Brackenridge, Pa., has doubled its die sinking capacity by the addition of new machinery.

L. A. Wyman has accepted a position in the sales department of the Dayton Pneumatic Tool Company with headquarters at Dayton, O.

Standard Steel Car Company has placed orders for two 1,500 horsepower Westinghouse-Parsons steam turbines for its new plant at Hammond, Ind.

Climax Stock Guard Company, 502 Title & Trust building, Chicago, reports the sale of 15 carloads of Climax clay cattle guards during the month of November.

National Lock & Washer Company, Newark, N. J., has established an office at 114 Liberty street, New York, in charge of Frank B. Archibald as general sales agent.

Middletown Car Works, Middletown, Pa., is making extensive additions to its plant including the erection of one or more buildings which will materially increase its output.

Wallace-Coates Engineering Company, Chicago, is to prepare plans for a reinforced concrete bridge across the Spokane river at Howard and Washington streets, Spokane, Wash.

Frank N. Johnson has resigned as president of the Scullin-Gallagher Iron & Steel Company to engage in other business and Harry Scullin has been elected to fill the vacancy.

Indiana Tie Creosoting Company, of Bloomington, Ind., has been incorporated with a capital stock of $100,000. The directors are: C. T. Dickson, Alvin T. Hert, and Morton C. Gould.

Chase-Shawmut Company, Newburyport, Mass., reports another order from the Northern Electric Company, Chico, Cal., for 61,000 Shawmut soldered rail bonds. The other order was for 32,000 of these bonds.

Chesapeake & Ohio has awarded to the T. H. Symington Company a contract to furnish the journal boxes for the 2,000 50-ton coal cars recently ordered by the railway from the Standard Steel Car Company.

W. T. Van Dorn Company, Chicago, manufacturer of the Van Dorn automatic coupler, reports large contracts on hand for different styles of drawbars, and an especially large number from new companies.

Sterling Cedar & Lumber Company, Charles, Mich., has been awarded a $30,000 contract for poles by the Toledo Railways & Light Company, and a contract for 60,000 ties by the Lake Shore Electric Railway.

Estell Car Seal & Equipment Company, capitalized at $500,000, has been incorporated in Colorado. The incorporators include J. M. Herbert, Loren B. Curtis, S. F. Estell, John B. Waterbury and Rodney Curtis, all of Denver.

U. S. Metal & Manufacturing Company of New York has engaged the services of Thomas Beaghen, Jr., formerly with the American Steel Foundries Company. Mr. Beaghen will have headquarters in the New York office.

Wisconsin Malleable Iron Company, Milwaukee, Wis., will increase its present capacity by the erection of a new annealing house, 70 by 240 feet, and two foundries each 70 by 180 feet, an office building and a new power plant.

Automatic Car Fender Company.—Incorporated in Maine with $500,000 capital stock to build fenders. Incorporators: President, A. E. Knowlton, Boston, Mass.; treasurer, O. S. Paul, Kittery, Me., where the office of the company is located.

Electric Cable Company of 17 Battery place, New York, has recently sold to Westinghouse, Church, Kerr & Co. a large amount of Voltax cables to be installed on the New York New Haven & Hartford Railroad Company's plant at Cos Cob, Conn.

Charles N. Wood Company, Boston, Mass., dealer in electric railway supplies and eastern agent for the R. D. Nuttall Company and the International Register Company, has removed its office to 79 Milk street, Postoffice Square building, Boston.

Buffalo Forge Company, Buffalo, N. Y., reports a recent order received through its London office for large steel plate fans with self aligning bearings and built of extra heavy material for use in the heating and ventilating shops of the Belgian State Railways.

Cassier's Magazine has been sold by the estate of the late Louis Cassier to Henry Harrison Suplee, for many years the technical editor of the Engineering Magazine, and James Van Vorst Colwell, recently works manager for the C. W Hunt Company, and the publication will be continued as heretofore by the Cassier Magazine Company at 3 West Twenty-ninth street, New York. The editorial conduct of the magazine will be in the hands of Mr. Suplee, who brings to this work a wide experience both in the practice of mechanical engineering and of technical journalism, while the business department will be directed by Mr. Colwell. The first issue of the magazine under the new management will be the January number.

Central Inspection Bureau, 17 State street, New York City, have secured the services of Mr. Jas. F. McGregor, of Detroit, Mich., who will represent them in the state of Michigan. The Detroit office of the bureau is located in the Majestic building.

Lorain Casting Company has been incorporated in Lorain, O., with a capital of $60,000 and will erect a foundry for the manufacture of gray iron castings. The incorporators are: R. Thew, E. M. Pierce, Hugh B. Davidson, Orville Root, and B. G. Nichols.

P. G. Ten Eyck has resigned as treasurer of the Federal Railway Signal Company to accept a position as general manager and chief engineer of the same organization. Clarence E. Newman, formerly assistant treasurer, has been appointed treasurer and secretary.

Ross Mechanical Firing Company has been incorporated in New Jersey to manufacture stokers, boilers and engines. The capital stock authorized is $100,000 and the incorporators include George G. Allen, Walter B. Horn, and William A. Ross, all of New York.

Crandall Packing Company, Palmyra, N. Y., has moved its Cleveland office from 9 South Water street to the Wade building, 805 Superior street, where it has enlarged its stock in order to properly handle the increasing business in stationary and marine lines.

F. P. Harrison Electric & Manufacturing Company, Inc., New York, reports that it has just signed contracts with five roads for the complete installation of its armature and field coils, Delta Beston magnet wire, "Cow Boy" brand coils, of which it is the sole manufacturer .

George A. Berry, until recently engineer of the company forces of the New York Central & Hudson River Railroad Company, has severed his connection with that company and has been elected vice-president and general manager of the Hicks Locomotive & Car Works, Chicago, Ill.

H. W. Johns-Manville Company, New York, has leased the building at 55-59 High street, Boston, and will move its Boston offices now located at 77 Pearl street, to the new building early in December. The steadily increasing business at the Boston office has compelled larger quarters.

American Car & Equipment Company of Chicago has removed its offices from 936 Monadnock, where it was formerly located, to its new quarters, 1537 and 1538 Monadnock. This change gives the company considerably more space than it formerly occupied and gives very spacious offices.

L. J. Bordo Company, Philadelphia, maker of the Bordo blow-off valves and Bordo swing joints, has established a general western sales office in the Western Union building, Jackson boulevard and Clark street, Chicago. Mr. Edward W. Hodgkins, vice-president of the company, will be in charge.

Blake Signal & Manufacturing Company, Boston, Mass., reports that it has signed contracts during the past month with various roads in the east and middle west amounting to over $12,000. The use of these signals in connection with the telephone system of dispatching is said to be rapidly growing.

Danville Car Company has been organized with a capital of $250,000. A tract of land on the outskirts of Danville, Ill., has been acquired and new shops will be erected, the contract for buildings having been awarded to H. F. Vogel & Company, 420 Rialto Building, St. Louis.

George Bancroft Kilbourne, manager at Chicago of the steel car department of the Kilbourne & Jacobs Manufacturing Company, Columbus, O., died on November 22 at the Grand Pacific hotel, Chicago, of pneumonia. He was 34 years old and is a son of James Kilbourne, senior partner in the company that bears his name.

Farlow Draft Gear Company, of Baltimore, has equipped 1,000 Atlantic Coast Line freight cars with its gear, to be used in connection with the Westinghouse friction barrel. The same company has equipped 1,000 Great Northern ore cars with the gear, which are building at the American Car & Foundry Company's Detroit Works.

H. W. Johns-Manville Company, whose headquarters are at 100 William street, New York, has opened a branch office at 315 Equitable building, Baltimore, Md., to care for the increasing business in that city and vicinity. The office will be in charge of W. F. Baird, previously connected with the Philadelphia branch of the company.

New Process Metal Company has been incorporated to take over the plant of Ridgway & Company, Columbus, O., and will succeed that firm in the manufacture of metal for bearings. Officials have been elected as follows: President and treasurer, H. G. Ridgway; vice-president, R. M. Irvin; secretary, F. V. Diehl; attorney, C. W. Drake.

Westinghouse Machine Company has an order for the Philadelphia Rapid Transit Company's Wyoming avenue power station for three turbine generator units, each of 6000 kilowatts capacity; these with the one now in course of erection will make four units of 6,000 kilowatts capacity each in this station. Six 1,500-kilowatts Westinghouse turbine generator units have been operating in this station for the past year, and their very satisfactory performance has led to the placing of the order for new units, making this one of the largest power stations in the country.

Crocker-Wheeler Company, Ampere, N. J., will furnish additional equipment for the Kingsland shops of the Delaware Lackawanna & Western. In addition to the two alternating current generators now in operation there is to be installed an additional alternating current engine type generator of 300 kilowatts, 480 volts, 225 revolutions per minute, 3-phase, 60 cycle, to furnish the increased demand for power.

Blake Signal & Manufacturing Company, 246 Summer street, Boston, announces that it has taken over the patent rights, good will, etc., in connection with the soldering flux tube formerly manufactured by the Climax Manufacturing Company of 1 Hartford street, Boston, Mass., and will in the future handle this flux tube in connection with other Blake patents. Some changes designed to improve the quality of the tube have been made.

M. R. Porter, who has been connected with the Belknap Hardware & Manufacturing Company, Louisville, Ky., and still interested in that company, has been appointed sales manager of the Pittsburg Gauge & Supply Company, though there is no connection between the two companies. The rapid growth of the Pittsburg Gauge & Supply Company has made it necessary to erect new buildings which are now in the course of construction at Thirtieth and Liberty streets, Pittsburg.

Detroit Insulated Wire Company, Detroit, Mich., which was recently incorporated with $100,000 capital stock to manufacture insulated wire and cable, is now receiving the machinery for its new plant in Detroit and expects to have it in operation within a month. The officers of the company are: President, E. E. Keller; vice-president and general superintendent, J. H. Hunter; secretary and treasurer, Arthur Hartwell, all of Pittsburg.

Solid Steel Tool & Forge Company, Brackenridge, Pa., has appointed the Spencer Otis Company, Railway Exchange, Chicago, exclusive representatives for the sale of car and locomotive forgings in the territory south of St. Paul and north of the St. Louis district and west beyond Pittsburg and Cleveland to the Pacific Coast. This arrangement does not affect the sale of track tools, nut locks, and other lines other than car forgings which will be handled as in the past by the company's eastern office.

Model Stoker Company, Dayton, O., has recently filled an order for the Model automatic smokeless furnace for boilers of 600 horsepower capacity, for the Friend Paper Company, West Carrollton, O., making the fifth order from this company since January, 1904. Recent orders also include one from the Canton-Akron Railway Company and one from the Western Ohio Railway Company for 2,000 horsepower of boilers. In the latter case the model furnace displaces hand fired furnaces and gives a fuel saving of $25 a day.

Henry A. Hitner's Sons has just purchased a large tract of land at Eddystone, N. J., where it is intended to erect one of the largest scrap iron places in the country, the great advantage of this new plant being its immense water front. William B Ilko, who for the past 12 years has been employed by this concern, has been appointed general manager of the New York office, located at 32 Broadway, and will receive correspondence relating to scrap iron, metals, second-hand machinery, railroad equipment, etc. The firm is well known in the trade as a dismantler of railroads, buildings, viaducts, bridges, battleships, steamships, etc.

Standard Varnish Works, 29 Broadway, New York, advises that its W. P. insulating black, devised specially for use in connection with interior wiring, signal telegraph and telephone work, has been approved by the Underwriters Laboratories of Chicago, which passes on various electrical appliances and materials used in wiring construction. It also reports that the material is being used extensively for all wiring and construction work and has received the recommendation of prominent engineers and construction concerns for this work on account of its ability to dry quickly and at the same time retain its plastic and water-proofing properties.

National Brake & Electric Company, Milwaukee, Wis., reports recent orders for generators for the following companies: Simmons Manufacturing Company, Kenosha, Wis., one 1,000-kilowatt engine type alternator; Union Electric Light & Power Company, St. Louis, Mo., two 500-kilowatt three-unit synchronous motor-generator sets and one 200-kilowatt induction motor-generator set; Proctor & Gamble (for Staten Island plant), one 400-kilowatt engine type alternator and one 125-kilowatt engine type alternator; Hicks Locomotive & Car Works, Chicago, Ill., one 500-kilowatt belted alternator; Clymer Power Company, Riegelsville, Pa., one 250-kilowatt waterwheel type alternator; United States Light & Traction Company, Hobart, Okla., one 250-kilowatt engine type alternator, and one 250-kilowatt engine type alternator for Sheridan, Wyo., plant of above company.

Roberts & Abbott Company, Cleveland, O., is making an examination of a large water power project at the Ox Bow of the Snake River in eastern Oregon. At this point the Snake River makes a loop about 2¼ miles long, the distance across the loop amounting to but a few hundred feet at the narrowest point. It is proposed to erect a dam at the narrow point about 30 feet high and build a tunnel through the neck of the loop, thus getting 22 feet additional fall, making a total drop of 33 feet. Mr. W. H. Abbott, of the company, is now in Oregon checking up the measurements and determining the minimum flow of water. It is claimed that in the dryest years there will be a flow at extreme low water of 5,000 feet per second, which would give a minimum of 25,000 horsepower. The feasibility of transmitting this power 140 miles to the various mines in the Seven Devils and Cornucopia country and the towers of Huntington, Weiser, Payette, Ontario and Boise is being considered. This project would be one of the largest and longest transmissions of electric energy in the world.

The T. H. Symington Company, selling agents for the Baltimore Railway Specialty Company, owners and manufacturers of the Baltimore ball bearing centre and side bearings, have very recently completed a modern malleable iron foundry for the manufacture of malleable castings required in connection with these bearings. The plant, which is designed so as to allow of indefinite unit extension of 20 tons capacity per unit, is located at Corning, N. Y., adjacent to one of the journal box plants of the T. H. Symington Company. The officers of the two companies are practically identical, and the foundry, which is now in full operation, in addition to supplying the malleable castings required by the Baltimore Railway Specialty Company, will take care of the malleable iron requirements of the Symington company, and handle additional malleable iron work from time to time.

William S. Love.

William S. Love, who for many years has been western representative of the Wheeler Condenser & Engineering Company, and since 1899 has been manager of its Chicago office, will remove to New York on January 1, 1907, to become general sales manager of the company, with offices at No. 42 Broadway. Mr. Love was graduated from the Washington University, St. Louis, Mo., in 1888, with the degree of mechanical engineer, and immediately became associated with the Pond Engineering Company, of St. Louis, which represented the Armington & Sims Engine Company, the Hoppes Manufacturing Company, the George F. Blake Manufacturing Company, and the Wheeler Condenser & Engineering Company, with others, and did a general business in machinery and the equipment of power houses. Later he was elected secretary of the Pond Engineering Company, and early in 1892 took charge of its Chicago office. When the company was dissolved Mr. Love continued in business as manufacturer's agent, on his own account, until 1895, when he was made manager of the Chicago office of the Abendroth & Root Manufacturing Company, although still retaining the Wheeler Condenser & Engineering Company agency. In 1899 when the Wheeler company established a Chicago office Mr. Love was placed in charge as manager, the position which he now holds. The Chicago office will be maintained, and Mr. Love expects to spend a considerable portion of his time there. He is succeeded as manager of the Chicago office by Mr. Grant Beebe.

Under-Feed Stoker Company, Chicago, reports a second order from the Lima & Toledo Traction Company, of Lima, O., for the installation of Jones stokers beneath two 400-hp. Babcock & Wilcox boilers, which will make a total of 2,900 hp. and 18 Jones stokers in that company's power station. A fourth order has been received also from the Chicago & Milwaukee Electric Railroad for the equipment of eight 600-hp. B. & W. units in its power station at Highwood, Ill. The Lincoln Traction Company, Lincoln, Neb., has contracted for 12 Jones stokers to be installed under six 264-h. p. B. & W. boilers in its plant. The three orders above mentioned represent the equipment of 7,184 hp. or a total of 40 stokers. The distinctive feature of automatic control of fuel and air supply regulated by the demands for steam, obtainable only in this system of mechanical firing, is of particular advantage in power stations where the load necessarily is uneven and often excessive.

Keystone Drop Forge Works, Chester, Pa., has found a solution of the difficulty experienced in making a suitable attachment for the trolley rope to the trolley pole. Usually a snap hook or open hook is used. The objection to the use of hooks of any kind is that when the trolley leaves the wire it is likely to strike the hook against the wire or some of the hanging structure and pull until something gives. A simple device made by the Keystone Drop Forge Works, while not designed for this use, has been found to serve the purpose admirably. It is a forged link, which this company makes in all sizes, for substituting where links are broken in chains. The forged link is hinged in the middle and opens longitudinally at both ends. When open, it may easily be interlinked between two sections of chain, and when in place and closed it forms a perfect and solid link. For a connection between trolley pole and trolley rope it is a device having no parts to grasp the wire when the trolley leaves the wire. The cars of two of the largest systems in the country have been equipped with this link. They are sold in lots as small as one dozen.

ADVERTISING LITERATURE

General Electric Company, Schenectady, N. Y.—Bulletin No. 4465 illustrates a number of types of trolley frogs. Bulletin No. 4467 describes the emergency straight air brake system.

McConway & Torley Company, Pittsburg, Pa.—A new edition of "Car Interchange Manual," 224 pages, 3½ by 5½ inches. This covers all the decisions of the arbitration committee from November, 1888, to May, 1906.

Buffalo Forge Company, Buffalo, N. Y.—A 14-page leaflet showing halftone illustrations of 31 blowers, forges, punch and spears and other machines for blacksmiths. The company calls special attention to its new compressed air forges.

Western Electric Company, Chicago.—"Hawthorne Works" is the title of a well illustrated pamphlet describing the works of the company and designed to call attention to the fact that the company is in a position to build heavy power apparatus.

J. G. Brill Company, Philadelphia.—Three handsome color prints mounted on gold mats suitable for framing have been issued to illustrate the best-known types of Brill cars, the Narragansett car, semi-convertible car and the convertible car.

International Timber Preserving Company, Railway Exchange, Chicago.—This company has issued a small pamphlet calling attention to "Neosote," which is its preparation for the treatment of timber and is a combination of the creosote and zinc processes.

De La Vergne Machine Company, Foot East 138th Street, New York.—A folder describing the Klein water cooling tower built by this company. These towers are designed to cool the water to from 5 to 15 degrees below the temperature of the atmosphere.

Westinghouse Electric & Manufacturing Company, Pittsburg, Pa.—Starting and field rheostats made by this company are fully described in circular No. 1139. The various parts in their standard forms with variations for particular installations are described in detail.

Mechanical Rubber Company, 230 Randolph Street, Chicago.—An exceptionally fine catalogue and price list, printed in colors, describing the belting, hose packings, and other rubber goods of the Chicago rubber works. The catalogue has 146 pages, 6 by 9 inches.

Fox Machine Company, Grand Rapids, Mich.—A number of improvements in the Fox universal wood trimmers of Style "F" have been made and bulletin No. 49 has been issued to call attention of users of this class of machinery to the new features of the machines.

Pittsburg Automatic Vise & Tool Company, Pittsburg.—A handsome little pamphlet calls attention to the automatic two-way vises which are the product of this company. It presents prices, principal dimensions and weight of various types of vises designed for particular services.

Westinghouse Traction Brake Company, Pittsburg, Pa.—A bulletin has been issued by this company describing straight-air brake equipments (D. C. Unit, T-2001) and superseding a previous bulletin of July, 1904. Westinghouse schedule SM airbrake equipments are fully described.

Carbolite Carbolineum Company, Ltd., Toronto, Can.—A substantial pamphlet issued by this company for the purpose of calling attention to its preservative process for railroad ties and similar purposes, presents much interesting data in connection with the general subject of timber preservation.

Bristol Company, Waterbury, Conn.—A new gauge catalogue No. 44, which describes a number of new ranges in recording devices in addition to those described in a previous catalogue No. 13, has been issued by this company. The new catalogue also shows a number of new gauges whose increments are uniform.

Detroit Graphite Manufacturing Company, Detroit, Mich.—Another one of this company's series of mailing cards bears the legend "Serviceable Paints for Particular Places," and calls attention to the company's graphite paint for protecting the steel work of buildings, bridges, tank cars and other steel structures.

Case Manufacturing Company, Columbus, O.—Bulletin No. 22 is a 32-page catalogue, 12 by 9 inches, showing recent improvements in electric cranes. The company states that it recently remodeled its factory and added a considerable amount of new and expensive equipment. The catalogue has over 25 halftone illustrations.

General Electric Company, Schenectady, N. Y.—The railway supply catalogue of this company is a cloth bound book of 234 pages, 8 by 10½ inches. It is filled with halftone illustrations and has a carefully prepared index to the large amount of matter in the book. A copy of this should be in the reference library of every electric railway engineer or contractor.

S. F. Bowser & Co., Fort Wayne, Ind.—Bulletin 57 describes the Bowser signal tower oil outfit, as now used on several of the largest railroad systems, and also shows an oil house supply car equipped with Bowser tanks and pumps. This company has been manufacturing oil tanks and pumps for 21 years and states that 350,000 of its tanks are now in satisfactory operation.

Allis-Chalmers Company, Milwaukee.—A new list of the publications of this company now in force has been issued by the department of publicity. It is a complete index arranged both numerically and classified according to subject. In the past 15 or 16 months this company has issued new bulletins describing 80 per cent of its products and it has taken 80 publications averaging nearly 24 pages, 8 by 10½ inches, to handle the matter in an adequate manner. Smelting furnaces and accessory equipment are described in a 48-page bulletin No. 1417.

C. I. Earll, 11 Broadway, New York.—Earll trolley retrievers and catchers are illustrated and described in catalogue No. 3, 20 pages, 5½ by 8½ inches. These retrievers are 7½ inches in diameter, about 5½ inches deep and weigh 12 to 18 pounds according to the style and service required. The halftone illustrations in the catalogue describe in detail the anatomy of the retriever.

H. B. Cameron Electrical Manufacturing Company, 95 Liberty Street, New York.—A catalogue and price list of commutators and segments. The company manufactures special as well as standard size commutators and segments for all standard railway motors; also does a large business on special work for power houses and electric lighting plants. The works of the company are at Ansonia, Conn.

Buckeye Engine Company, Salem, O.—An interesting catalogue describing Buckeye electric blue printing machines. The company claims that the first blue prints shown in the United States were exhibited by Switzerland at the Philadelphia Exposition in 1876 and that the same year the Buckeye Engine Company adopted this method of copy. The catalogue has a list of 100 prominent firms that use its blue printing machine.

Standard Motor Truck Company, Pittsburg, Pa.—A well printed catalogue describes the solid-forged rolled steel double and single electric trucks manufactured by this company which are of the M. C. B. type of construction and designed for all classes of high speed city and interurban railway service. Halftone engravings show the details of trucks which are in successful use by various lines and engravings from working drawings present the details of construction in an adequate manner.

Ingersoll-Rand Company, 11 Broadway, New York.—"Imperial Motor Hoists and Stationary Motors" is the title of bulletin No. 2008 which is a standard 6 by 9-inch pamphlet, as are all the publications of the Ingersoll-Rand Company. The pamphlet contains a complete description of the Imperial motor hoists with illustrations and tables of sizes and dimensions. This is followed by a section devoted to a stationary motor designed for all purposes requiring a small but powerful engine for intermittent service.

New York Central & Hudson River Railroad.—As a result of hundreds of inquiries for information in regard to the electric locomotives which are to be used on the New York Central, the bureau of publicity of the company has issued a pamphlet briefly describing them. The builders of the locomotives, the General Electric Company and the American Locomotive Company, have prepared the statement and the information is accordingly thoroughly accurate. A few interesting engravings from photographs complete the publication.

Sherwin-Williams Company, Cleveland, O.—This company recently held its fortieth anniversary and twenty-sixth annual convention of the sales department and in commemoration of the event the publicity department issued from its own printing establishment a number of handsome souvenirs. One of these is a leather bound publication outlining the growth of the company. Another is a 28-page song book of Sherwin-Williams songs which indicate the keynote of the company's success which is largely due to the enthusiasm of its employes in their departments. The company has also issued a convenient leather bound note book.

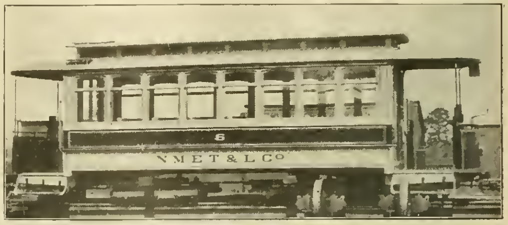
Frost Railway Supply Company, Detroit, Mich.—This company has reprinted in convenient pamphlet form a paper by Mr. W. O. Thompson entitled "Friction Draft Gear on Cars and Locomotives" which was presented before the May, 1906, meeting of the Central Railway Club and an article by Mr. A. Stucki entitled "Functions of a Good Draft Gear" which was published in the Railroad Gazette. The publication is being sent to railroad people with the idea of contributing the latest ideas on the subject of improved draft practices, and in an unobtrusive manner calls attention to the points in which the Harvey friction draft spring fulfills requirements which the writers of the papers consider are demanded by present service.

Consolidation Type Freight Locomotives.—A pamphlet just published by the American Locomotive Company illustrates and describes consolidation locomotives weighing more than 175,000 pounds. It is a sequel to the pamphlet issued in October presenting designs of this type weighing less than 175,000 pounds. In the pamphlet 28 consolidation locomotives built for various railroads and ranging in weight from 175,000 pounds to 250,000 pounds are illustrated and the principal dimensions of each design given. This is the fourth of the series of pamphlets which is being issued by the American Locomotive Company and intended to include all the standard types of locomotives. The series now cover the Atlantic (4-4-2), Pacific (4-6-2) and Consolidation (2-8-0) types. Copies of these pamphlets may be had upon request.

Waterbury Farrell Foundry & Machine Company, Waterbury, Conn.—This company has issued a new catalogue of 77 pages illustrating and describing its new machines for the use of persons engaged or about to embark in the rivet, screw and bolt business. The catalogue illustrates and calls attention to the company's several styles of headers, comprising open die single stroke, solid die single stroke, open die double stroke, solid die double stroke, as well as several sizes of 3-blow and 4-blow headers. It is stated that these machines have been improved and built throughout to secure great strength, durability, speed, ease of operation and adjustment. Attention is also given to the company's re-heading presses, threaders, etc. The description is accompanied by tables of specifications for the various types of machine.

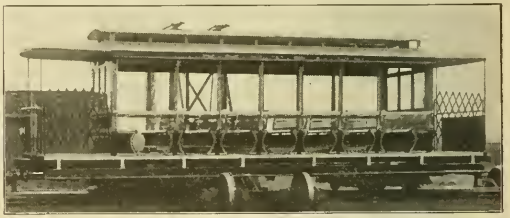
STEPHENSON CARS FOR AUSTRALIA.

The two types of cars illustrated constituted a recent export shipment by the John Stephenson Company, the order being placed through J. G. White & Co., for the North Melbourne Electric Tramway & Light Company. There were ten of the closed cars in the shipment and five of the open cars. On consulting the photograph of the open car one is impressed with the extreme length of the platforms, the advisability of which will be appreciated when it is remembered that in Australia the law requires that each passenger must be provided with a seat, the option of standing being granted only to those who may care to remain on the platform, a majority of such passengers being smokers. Aside from this feature the cars will be found similar to those used for summer travel in this country. The principal dimensions follow: Length over end posts, 21 feet 1⅝ inch; over crown pieces, 39 feet 9 inches; width over sills, 6 feet 11¼ inches; height from floor to ceiling, 7 feet 8 inches; size of side sills, 3¾ feet by 7 inches.



Closed Car—North Melbourne Electric Tramway & Light Company.

The closed car illustrated is of the ordinary drop-sash variety and is equipped with Brill transverse seats of cane; length over end posts, 20 feet 8 inches; over crown pieces, 30 feet 8 inches; width over sills, 8 feet; height from floor to ceiling, 7 feet 11½ inches; size of side sills, 4¼ feet by 5⅜ inches; end sills measure 3½ by 7¾ inches; sill plates, 6 by 3½ by ½ inch angle iron; length of seats, 34 inches; width of aisle, 21 inches. Both types of cars were mounted on the Brill No. 21-E single truck having a wheel base of 7 feet, and two motors of 40 horsepower capacity each were installed in each case. The finish is in ash, with mouldings of carved oak. Specialties, such as angle-iron bumpers, sand-boxes, radial drawbars, etc., are of Brill make. The cars were built so they could be knocked down for export shipment.



Open Car—North Melbourne Electric Tramway & Light Company.

THE SPOKANE-PEND d'OREILLE RAPID TRANSIT COMPANY.

The Spokane-Pend d'Oreille Rapid Transit Company, Limited, has commenced laying steel on its proposed line and announces that the work will be hastened to completion. The right of way for the line, which is to extend from Spokane, Wash., to Pend d'Oreille Lake, Idaho, a distance of 46 miles, and franchises covering passenger, mail and express privileges, have been secured in Spokane and other towns through which the line is to run.

Although the route selected for the line is over a hilly territory, the maxium grade on the interurban sections is to be 1 per cent and on the city streets 3.5 per cent. There are to be three tangents of 10 miles each on the line and the number of curves is to be kept down so that cars can be operated at high speeds. The work of building this railroad will include some heavy track and roadway and bridge construction. Seventy-pound steel is to be used and the line is to be ballasted with gravel. Passenger and freight terminals have been secured near the business center of Spokane and plans for the erection of terminal stations have been completed.

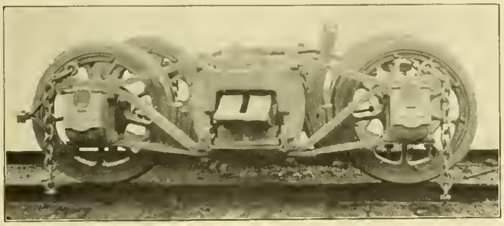
The territory to be served by the line includes the productive Spokane valley, the rich mining districts of Washington and Idaho, and the many lakes that are now leading summer resorts of the northwest, but which heretofore have not been given railway connections to the outside country.

Following the plan of some of the California electric railway companies, the officers of the Spokane-Pend d'Oreille Rapid Transit Company have secured statements from the producers of the tributary territory to be served which guarantee to the company an annual freight tonnage of more than 400,000 tons. The company's lines will connect with the Northern Pacific, the Spokane International and the Oregon Railway & Navigation companies' railroads, so that the interchange and transfer of freight in carload shipments can be made without delay.

The officers of the company are: C. H. Reeves, president; J. J. Browne, first vice-president; D. K. McDonald, second vice-president; J. Grier Long, treasurer; R. A. Hutchinson, general manager; Mark F. Mendenhall, secretary; James C. Cunningham, W. S. McCrea and Harry A. Rhodes, trustees.

ELECTRIC SWITCHING LOCOMOTIVE FOR THE GENERAL ELECTRIC COMPANY.

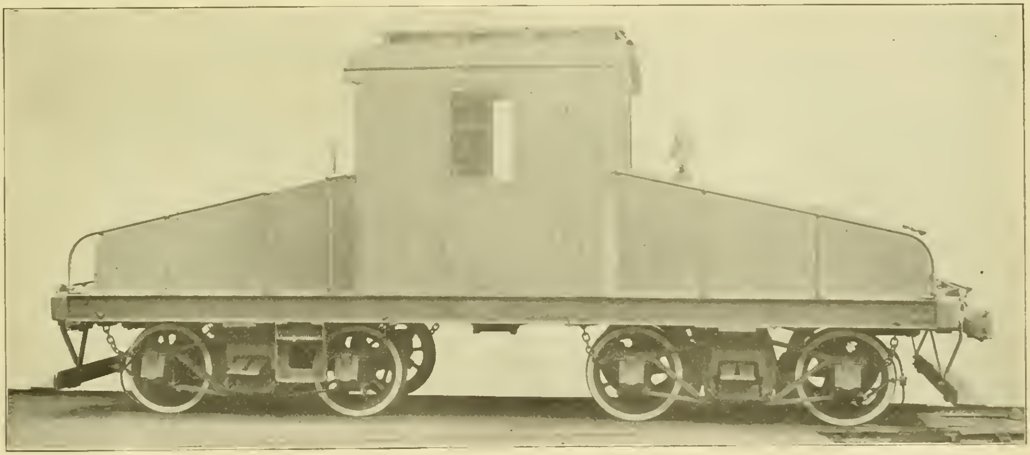
The American Locomotive Company has recently completed a 37½-ton electric switching locomotive for the General Electric Company, which is designed for operation on a 250-volt circuit. The maximum tractive effort is 15,000 pounds, and the instantaneous draw-bar pull for starting purposes is 18,800 pounds.



Electric Switching Locomotive—Side View of Truck.

The running gear consists of two American Locomotive Company's 4-wheeled arch bar frame trucks with cast-iron floating bolsters. Each truck is equipped with two 175-horsepower General Electric type 68-B direct-current motors. The motors are inside hung, with half the weight carried on the axle and half by nose suspension from the truck frame.

The locomotive is arranged for single-unit control and is fitted with trolley and third rail shoes. It is equipped with General Electric Company's straight air brakes and Leach sander, operated by one centrifugal pump air compressor with capacity for 22 cubic feet of free air per minute. The platform framing is of 10-inch steel channels, on which are 3-16-inch floor plates. The cab is of the steeple type and consists of one main cab and two auxiliary cabs.



Electric Switching Locomotive.

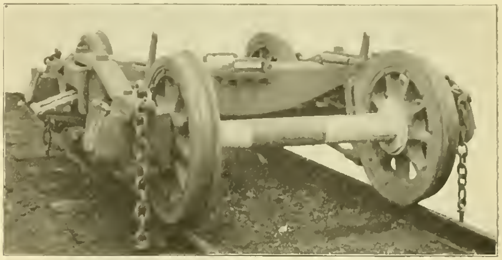
Some of the principal dimensions of the locomotives are:

Length over all	31 ft. 1 in.
Width	9 ft. 6¼ in.
Total wheel base	22 ft.
Driving wheel base	6 ft. 6 in.
Height over cab	12 ft. 1¾ in.
Height with trolley down	13 ft.
Truck wheels	36 in.

NEW TYPE OF HIGH-SPEED CORLISS ENGINE.

In view of the rapid advancement which has taken place within the last 10 years in the use of alternating current for power and lighting purposes and the increasing demand of the purchaser for a more economical engine than that of the ordinary high-speed automatic pattern, the Hooven, Owens, Rentschler Company, Hamilton, O., is placing on the market a new high-speed Corliss engine which is known as Type H. S. It differs from the regular Corliss type in that the stroke is shorter, there are no dash pots, the valve gear is positive-driven and the governor is of the inertia type located in the wheel.

In this engine the frame or bed is brought down to the floor and no foundation or subbase is needed above the floor line. The frame is made in one piece and is of the regular Corliss heavy-duty pattern. The valve gear is designed to give the quickest possible opening and closing of the steam valves on the forward stroke and a rest during the return stroke or while the valve is unbalanced. A system of bell-crank levers has been substituted for the usual rocker plates by means of which a double-distorted movement of the gear is obtained. The steam-valve stems are supported on both sides of the valve crank. The exhaust valve gear has been brought very close to the cylinder and the greater portion of the steam valve gear is also very close to the cylinder walls. By the use of a special metallic valve stem packing on the interior of the cylinder the use of stuffing boxes and glands on the outside is eliminated.



Electric Switching Locomotive—End View of Truck.

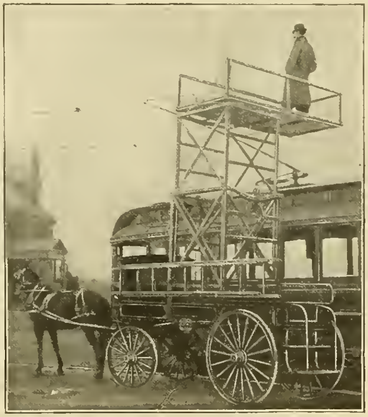
The cranks and eccentrics of this engine are entirely enclosed in sheet steel oil guards which may easily be removed so that all parts are accessible for quick inspection. The governor is of the centrifugal type and is composed of two weights and opposing springs and is so designed that it can be made small, light and very powerful.

This type of engine is made in all sizes from 50-horsepower capacity upward, in the single-cylinder, tandem and cross-compound types of both the horizontal and vertical designs. The range of speed for this type of engine is from 125 to 200 revolutions per minute.

It is reported that the Seminole Power Company will build an electric railway from Ft. Meyers to Ft. Thompson, Fla.

A LIGHT TOWER WAGON.

The "Trenton" trolley wagon, which is shown in the illustration, was placed on the market several years ago by the J. R. McCardell Company, of Trenton, N. J., to meet the demand for a thoroughly practical tower wagon. One of the principal features of this wagon is the collapsible extension platform, which may be folded up compactly when out of use and which may be elevated to allow the passage of cars while work on the overhead wires is in progress without moving the wagon. The illustration shows the platform extended and partially elevated over a passing car.



Trenton Trolley Wagon.

The platform revolves on a large wrought-iron circle, bolted securely to the top of the tower. It is 9 feet long by 4 feet wide, is strongly trussed, and is provided with a positive clutch, easily and quickly applied, which will hold it firmly in any position.

These wagons are made for either one horse or two horses, and the one-horse type is provided with a pole so that two horses may be used if desired. The one-horse wagon is precisely similar to the two-horse form except that it is of lighter construction.

This wagon has often proved valuable in case of fires, as several lines of hose can be passed over the extended platform, thus preventing any stoppage of cars. It is also well adapted for use in painting poles on account of the reach and size of the extended platform and the fact that it can be easily and quickly set in any desired position.

The tower is very light in construction and can be operated by one man, and is rigidly built and firmly braced so that it cannot become unjointed.

The body is 11 feet long, not including steps or footboard, and 4 feet 3 inches wide; the framework is of selected seasoned white oak. There is a space for a locker in front of the tower and for two in the rear.

The tower is firmly set in the sills, with thoroughly braced angle-iron slides bolted to the posts on the outside corners of the upper and inside corners of the lower tower, and is elevated by steel cables running over revolving sheaves set in slide bearings. The cylinder is of wrought iron, operated with a compound gear, fitted with a ratchet and brake. The height of the tower is 19 feet 4 inches extended and less than 11 feet when lowered.

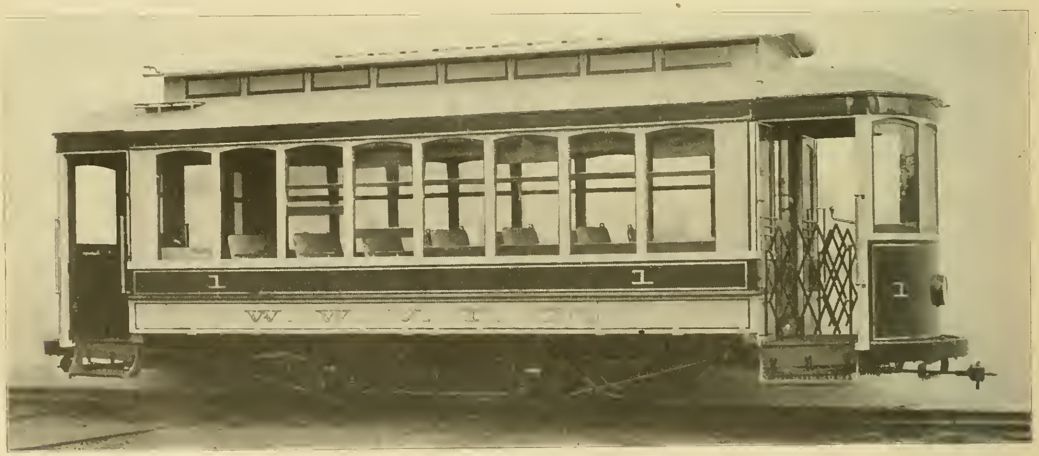
LARGE ORDERS FOR CRANES.

The Case Manufacturing Company, Columbus, O., makers of cranes and hoists, is erecting an addition 80 by 140 feet of brick and steel construction for its crane erecting shop and to provide space for a new heating plant for the entire works. The company now has its cranes in service in many of the large railroad shops including the Bloomington shops of the Chicago & Alton where there are two 25 and two 50-ton cranes; the Mount Clare shops of the Baltimore & Ohio; 31 cranes in various shops of the Pennsylvania; 8 cranes in the shops of the Chicago Rock Island & Pacific; a 35-ton double trolley hoist at the Cos Cob shops of the New York New Haven & Hartford; a 60-ton crane for the Lake Shore & Michigan Southern at Gibson, Ind., and a 20-ton crane at the Collinwood shops of the same road. The company reports that it is now building a 15-ton and a 75-ton crane, the latter a double trolley 7-motor crane for the Kingsland shops of the Delaware Lackawanna & Western and will shortly install a 5-ton and two 10-ton cranes at the Columbus shops of the Hocking Valley and a 10-ton Gantry crane for the Chicago Milwaukee & St. Paul. The company has also secured orders for cranes from companies closely identified with the railways. These include: Pittsburg Reduction Company, 23 cranes, for their plants at Massena, N. Y., Niagara Falls, N. Y., and Shawinigan Falls, P. Q., Canada; Ralston Steel Car Co., Columbus, O.; American Steel & Wire Company, Cleveland, O.; Middletown Car Works, Middletown, Pa.; Pittsburg Steel Foundry Co., Pittsburg, Pa.; Pressed Steel Car Co., Pittsburg, Pa.; Wagner Electric Company, St. Louis, Mo.; American Locomotive Works, Schenectady, N. Y.; International Steam Pump Co., Cambridge, Mass.; Midvale Steel Co., Philadelphia, Pa.; General Electric Company, Schenectady, N. Y.; Buckeye Steel Castings Company, Columbus, O.; and numerous others.

CARS FOR WALLA WALLA, WASHINGTON.

A number of Brill semi-convertible cars have recently been furnished to the Northwestern Gas & Electric Company for use on the street railway system in the city of Walla Walla, Wash. The cars are also intended for operation over an interurban line extending for 13 miles to Milton and Freewater, which are situated just over the border in the state of Oregon. The territory is quite a populous one in comparison to some of the sparsely settled districts to be found in this section of the country, and as the country traversed is in a high state of cultivation throughout, a large increase in passenger traffic is imminent.

The cars of the present order are of the builders' standard construction and are mounted on the Brill 21-E single truck with a wheel base of 7 feet. Length over end panels is 21 feet 4 inches and over vestibules 30 feet 4 inches; width over sills including sheathing 7 feet 10½ inches, and over posts at belt 8 feet 2 inches; sweep of posts 1¾ inches; distance from center to center of posts 2 feet 5 inches; side sills are 5 inches by 8 inches, and end sills 4½ inches by 8 inches. The semi-convertible feature permits of roomy seats and generous aisle-space, the former measuring 36 inches, and the latter 22 inches. The motors installed are of 40 horsepower capacity each. The American Car Company is building five additional cars containing the Brill semi-convertible feature for this road.



New Brill Car for Walla Walla, Wash.

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